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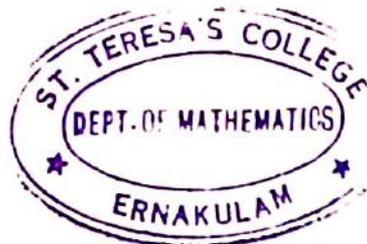


CERTIFICATE

This is to certify that the dissertation entitled, **A STUDY ON THE ACCEPTANCE OF COVID-19 VACCINE** is a bonafide record of the work done by Ms. **LAKSHMI BALACHANDRAN** under my guidance as partial fulfillment of the award of the degree of **Bachelor of Science in Mathematics** at St. Teresa's College (Autonomous), Ernakulam affiliated to Mahatma Gandhi University, Kottayam. No part of this work has been submitted for any other degree elsewhere.

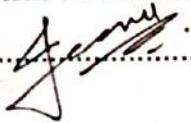
Date: 7/03/2022  
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Project Report

On

**A STUDY ON THE ACCEPTANCE OF  
COVID-19 VACCINE**

*Submitted*

*in partial fulfilment of the requirements for the degree of*  
**BACHELOR OF SCIENCE**

*in*

**MATHEMATICS**

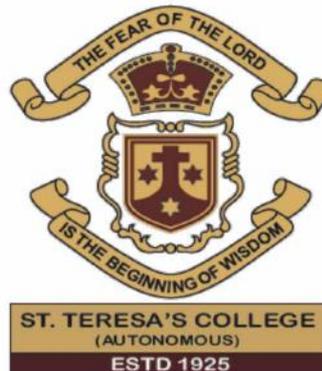
*by*

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**APRIL 2022**

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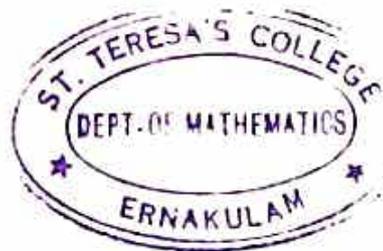
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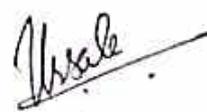
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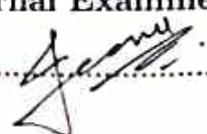
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# DECLARATION

I hereby declare that the work presented in this project is based on the original work done by me under the guidance of Dr.Elizabeth Reshna M T, Assistant Professor, Department of Mathematics, St. Teresa's College(Autonomous), Ernakulam and has not been included in any other project submitted previously for the award of any degree.



Ernakulam.

LAKSHMI BALACHANDRAN

Date: 7/03/2022

AB19AMAT055

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Ernakulam.  
Date:7/03/2022

LAKSHMI BALACHANDRAN  
**AB19AMAT055**

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# Chapter 1

## INTRODUCTION

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Coronavirus disease (COVID-19 ) is an infectious disease caused by the SARS-CoV-2 Virus.

The majority of people who are injected with the virus will get mild to severe respiratory infection and recover without the need for additional treatment. Some, on the other hand, will become critically unwell and require medical assistance. People who are older and those who are disabled with underlying medical issues such as heart disease, diabetes, and cancer, people who have asthma or chronic obstructive pulmonary disease are more likely to acquire serious illness. COVID-19 can make you sick and cause you to get extremely ill or die at any age.

The release of the COVID-19 vaccine represents a significant step toward slowing the pandemic's spread and reducing sickness and deaths. On January 16, 2021, India began administering COVID-19 vaccines. As of December 31, India has administered around 1.44 billion doses in total as of December 2021, including first and second doses of presently available vaccines In India, 90% of the eligible population received atleast one dose, and 64 percent were fully immunised.

India reported the first confirmed case of COVID-19 infection on 30th January 2020 in the state of Kerala. The affected had a travel history that began in Wuhan, China.

We have gone through various survey reports with objectives similar to our

project. Some of those survey results are given below. In a survey on the topic "Acceptance and concerns regarding the COVID-19 vaccine in Kerala", they received 314 participants, of which 84% were willing to take vaccination or were already vaccinated, and 16% were unwilling to take vaccination. The major reasons for the hesitancy reported by those unwilling to take the vaccine were anxiety about adverse reactions and concern regarding the efficacy of the vaccine. Another survey on the topic "COVID-19 vaccine acceptance: beliefs and barriers associated with vaccination among the general population in India" had 351 participants, among whom 64.4% were concerned about COVID-19 vaccine side effects, while 20.2% of the respondents lacked confidence in the effectiveness of the vaccination. 72.9% responded that they would get vaccinated if the effectiveness and safety of the COVID-19 vaccine were confirmed using further studies. The state government survey on COVID-19 vaccine hesitancy in Tamil Nadu has found that the elderly population in Tamil Nadu was the most hesitant compared to other age groups. The reasons for the hesitancy from this survey were fear of injections, fear of complications, and confidence that they would not get COVID-19.

## 1.1 BACKGROUND OF THE STUDY

There is a need to understand the level of acceptance and hesitancy towards the COVID-19 Vaccine in the population. The study was carried out to estimate the level of vaccine acceptance and hesitancy among the people in Ernakulam district. Study also aims to understand the factors that can improve vaccination. This may help to design appropriate behavior change communication campaigns to improve the acceptance of COVID-19 Vaccine.

## 1.2 OBJECTIVE

- To study the acceptance of COVID-19 Vaccine.
- To study whether there is any relation between people's education and acceptance of COVID-19 Vaccine.
- To study whether there is any relation between place of residence and acceptance of COVID-19 Vaccine.
- To Study the reason for the reluctance to take the vaccine.
- To study the factors that can improve the COVID-19 Vaccine acceptance.

## 1.3 SIGNIFICANCE OF STUDY

- Major findings of this study can be used in planning vaccination campaigns.
- The study identifies major concerns regarding efficiency and safety of the covid-19 vaccine.
- The study also identifies the key barrier for vaccine acceptance.
- This can help the decision makers to formulate various strategies that can help to implement covid-19 vaccination successful.

## Chapter 2

# DATA DESCRIPTION

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### 2.1 DATA SOURCE

There are two types of data collection procedures utilised by researchers: primary and secondary. The questionnaire method is included in the primary level.

Second, we have a way in which we employ already collected data. We've used the primary method for collecting data.

### 2.2 VARIABLES UNDER CONSIDERATION

The study was conducted using an online self administered questionnaire. The questionnaire was circulated using google form through social media platforms. The online questionnaire address several variables including the socio-demographic parameters, believes towards COVID-19 vaccine acceptance, potential barriers that may prevent from being vaccinated and factors that can improve COVID-19 vaccine acceptance. The target population for the survey was individuals above 18 years among the population of Ernakulam district.

## Chapter 3

# METHODOLOGIES

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### 3.1 EXPLORATORY DATA ANALYSIS

Exploratory data analysis consists of descriptive properties of data. One of the methods used for exploratory data analysis is the graphical method. Here, bar graphs and pie charts are used for analysing the qualitative data.

A bar chart or bar graph is a chart or graph that presents categorical data with rectangular bars with heights or lengths proportional to the values that they represent. The bars can be plotted vertically or horizontally. Bar graphs or charts provide a visual presentation of categorical data. Categorical data is a grouping of data into discrete groups.

A pie chart is a type of graph that represents the data in a circular graph. The slices of pie show the relative size of the data, and it is a type of pictorial representation of data. A pie chart requires a list of both categorical and numerical variables. Each sector denotes a proportionate part of the whole.

## 3.2 CHI SQUARE TEST

The Chi-square test of independence is a statistical hypothesis test used to determine whether two categorical or nominal variables are likely to be related or not.

We can use the test when we have counts of values for two categorical variables. We Can also use the test if we have only a table of values that shows frequency counts. The Chi-square test of independence checks whether two variables are likely to be related or not. We have counts for two categorical or nominal variables. We also have an idea that the two variables are not related. The test gives us a way to decide if our idea is plausible or not.

For the Chi-square test of independence, we need two variables. Our idea is that the variables are not related. The hypothesis for a chi-square test of independence are Null Hypothesis and Alternative Hypothesis. In Null Hypothesis we assume that there is no association between the two categorical variables in the population of interest. And in Alternative Hypothesis we assume that there is association between the two categorical variables in the population of interest. The null and alternative hypotheses are two mutually exclusive statements about a population of interest. A hypothesis test uses sample data to determine whether to reject the null hypothesis.

Null hypothesis ( $H_0$ )

The null hypothesis states that a population parameter (*such as the mean, the standard deviation, and so on*) is equal to a hypothesized value. The null hypothesis is often an initial claim that is based on previous analyses or specialized knowledge.

Alternative Hypothesis ( $H_1$ )

The alternative hypothesis states that a population parameter is smaller, greater, or different than the hypothesized value in the null hypothesis. The alternative hypothesis is what you might believe to be true or hope to prove true.

For chi square test first we have to fix the null hypothesis and alternative hypothesis and Create contingency table of observed frequency and expected frequency. The expected frequency of each cell is equal to the marginal frequency of the row and column that corresponds to a given cell in the observed contingency table divided by total sample size. And find p-value. If p-value is less than the significance level then we reject  $H_0$  and if the p-value greater than significance level then we accept  $H_0$ .

We can calculate the  $\chi^2$  value using the formula,

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

Where,

$O_i$  - Observed value

$E_i$  - Expected value

# Chapter 4

## DATA ANALYSIS

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### 4.1 SOCIO-DEMOGRAPHIC CHARACTERISTICS

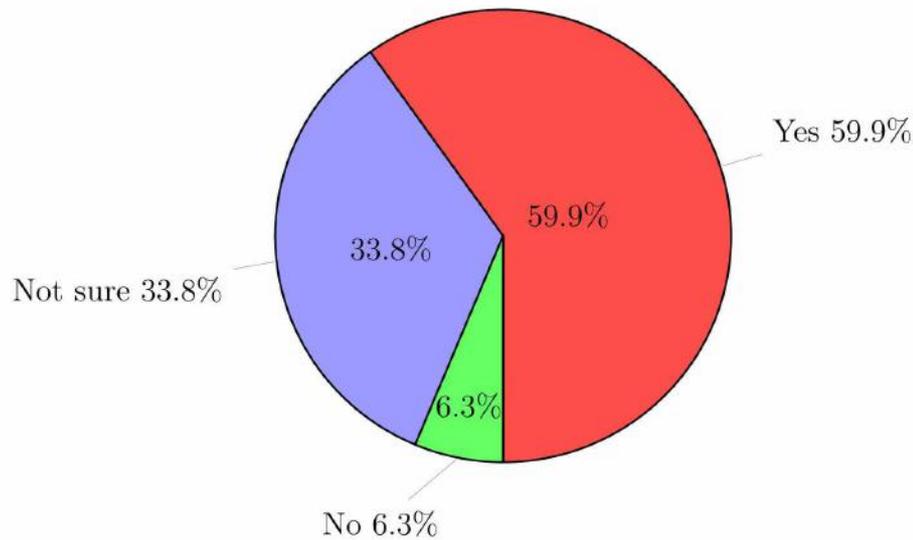
Characteristic	Percentage
<b>Gender</b>	
Male	24.80%
Female	75.20%
<b>Residence</b>	
Urban	56.30%
Rural	43.70%
<b>Education Qualification</b>	
SSLC or less	4.50%
Plus - two	31.30%
Undergraduate	58.10%
Post graduate	5.40%
Others	0.70%
<b>Occupational status</b>	
Student	79.10%
Unemployed	5%
Private job	13.10%
Govt. job	2.90%

Figure 4.1: figure showing the profile of respondents

Total of 444 people participated in the survey. About 75.2% were females and 24.8% were males. Also from the sample, 56.30% was from urban and 43.70% from rural. Among the population 79.1% were students, 5% were unemployed,

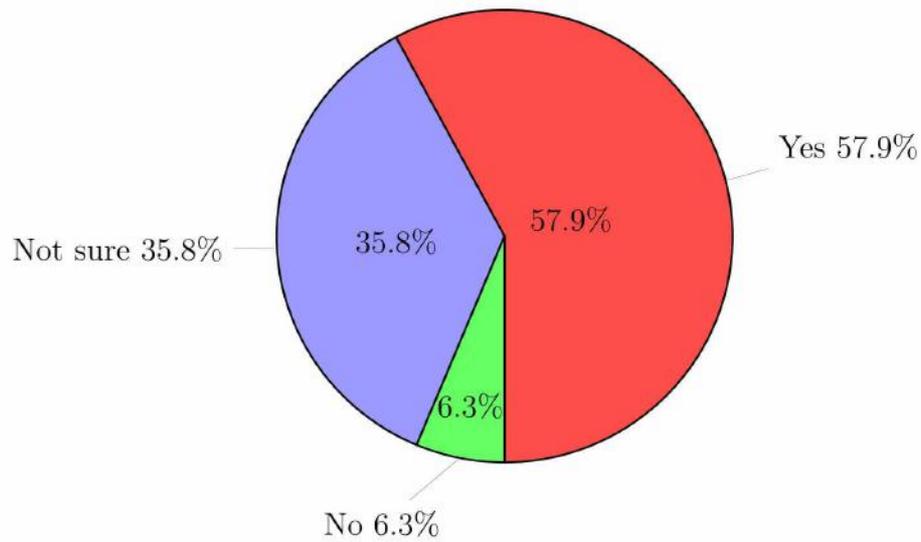
13.1% had private job and 2.8% had government job. From the survey 58.1% were UG/Graduates, 5.2% were SSLC or less, 31.3% plus two (Pre-degree) and 5.4% were Post Graduates

## 4.2 VACCINATION AGAINST COVID-19



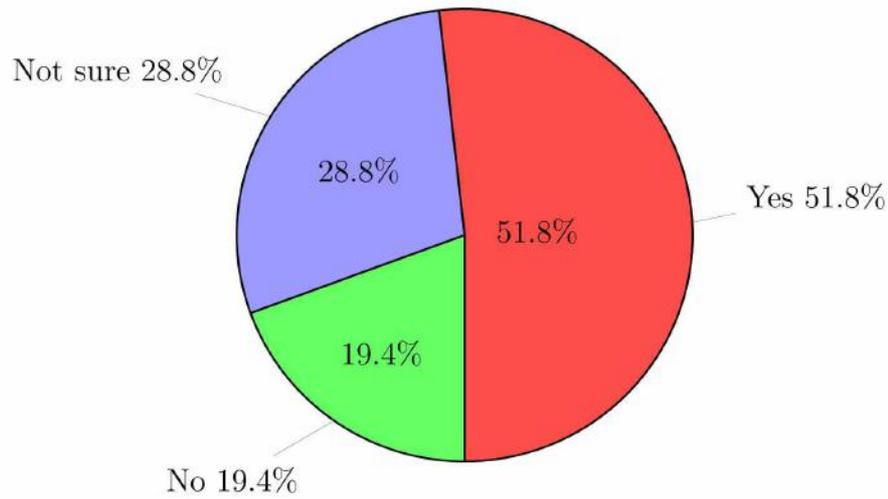
*Pie diagram showing the response of participants regarding their belief on safety towards COVID-19 vaccination*

Among the population, 59.9% believe that the COVID-19 vaccine is safe and 40.1% believe that the COVID-19 vaccine is not safe.



*Pie diagram showing the response of participants regarding their belief on effectiveness towards COVID-19 vaccination*

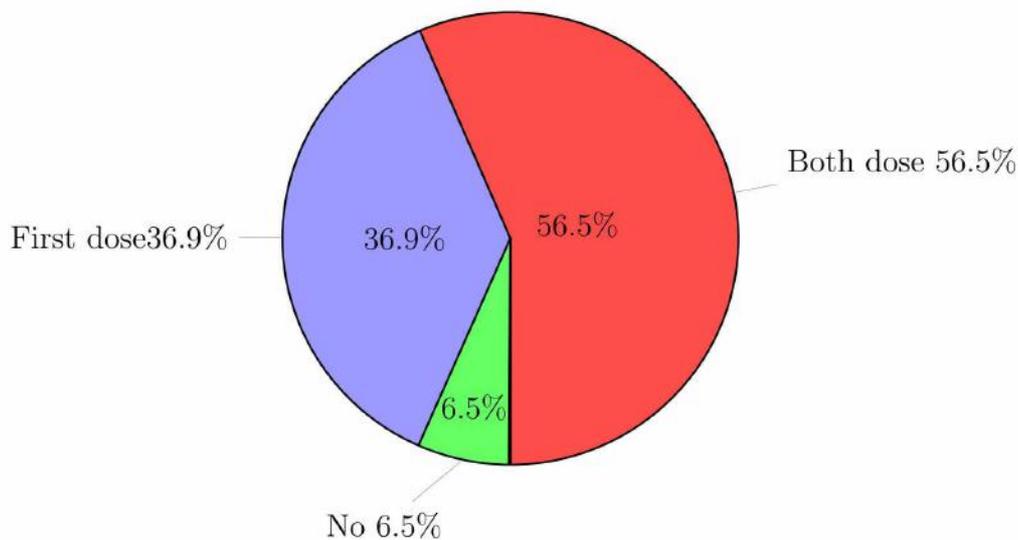
57.9% of people believe that the COVID-19 vaccine is effective, and 42.1% believe that it is not effective.



*Pie diagram showing the response of participants regarding their belief on best method to prevent COVID-19*

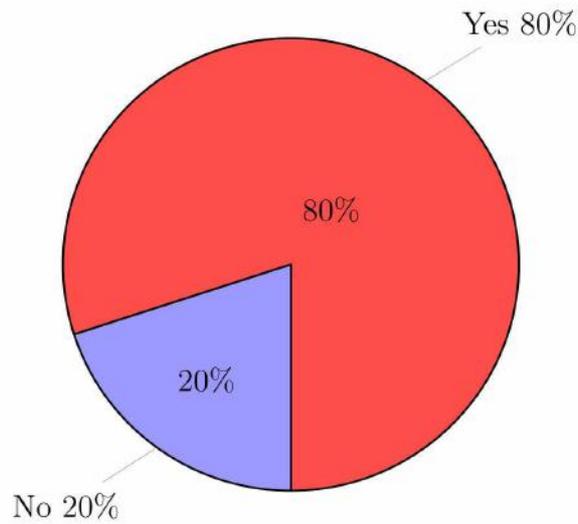
However, 51.8% agreed that immunisation is the most effective strategy to avoid covid 19 problems and 48.2% were against. In conclusion about half of the individual's had good attitude towards covid 19 immunisation.

### 4.3 ACCEPTANCE OF THE COVID-19 VACCINE



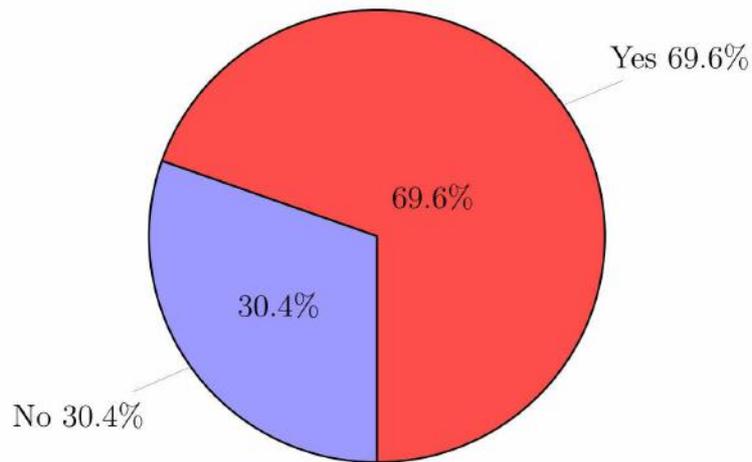
*Pie diagram showing the response of participants regarding if they have taken the vaccine.*

36.9% completed their first dose of vaccine and 56.5% completed both first and second doses of vaccine. 6.5% were not vaccinated. Majority of population were taken the vaccine.



*Pie diagram showing the response of participants regarding their willingness to take the vaccine.*

Among the non vaccinated people (6.5%), 80% shows their willingness to take the vaccine and 20% were unwilling to take the vaccine.



*Pie diagram showing the response of participants regarding if they have taken the vaccine because it was legally mandatory.*

69.6% of the population have taken the vaccine because it was legally mandatory and 30.4% have taken it in their own interest.

#### 4.4 BARRIERS ASSOCIATED WITH COVID-19 VACCINE

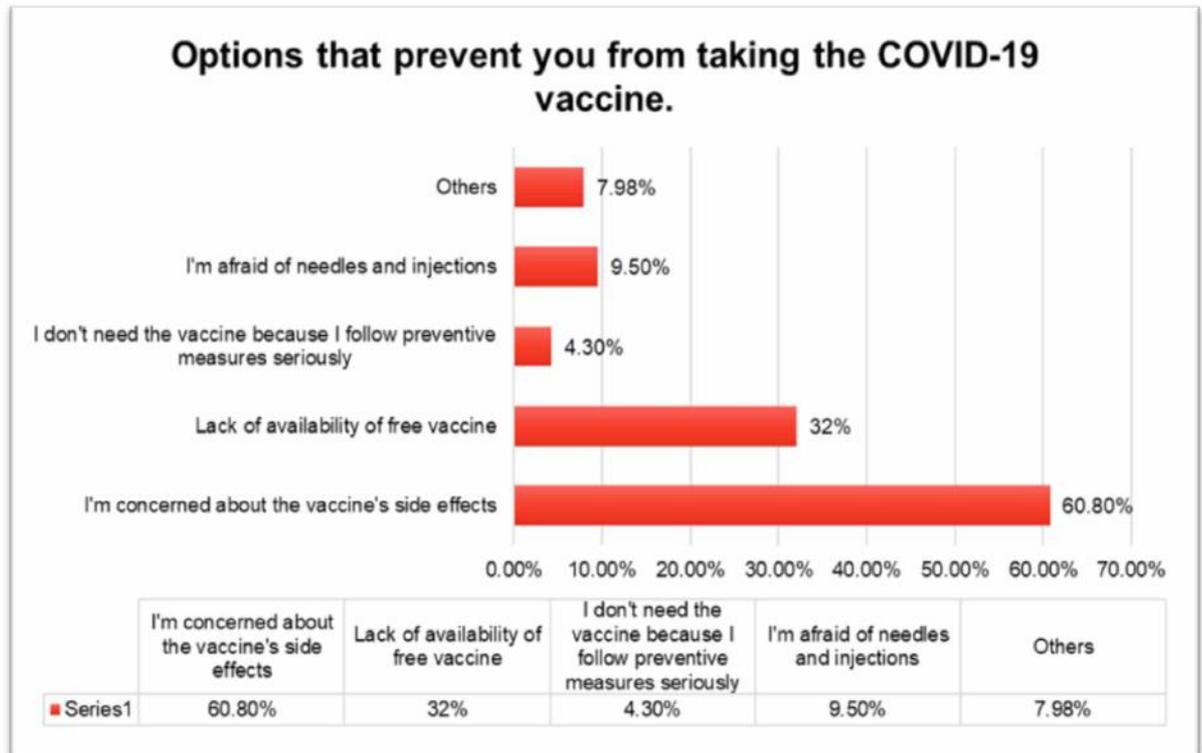


Figure 4.2: The response of participants regarding the barriers associated with COVID-19 vaccination. The cumulative percentages exceeded beyond 100% since the participants can choose more than one answer

A single question with several reasons was used to investigate the challenges to COVID-19 vaccine acceptance. 60.8% were anxious about the side effects of the vaccine, and 32% reported the lack of availability of free vaccine as a factor that prevented them from taking the vaccine. 9.50% of the population are reluctant to get vaccinated due to the fear of needles and injections. 4.30% of the population don't think they need to be vaccinated because they believe they are taking enough preventive measures and 7.98% for other reasons.

## 4.5 FACTORS THAT CAN IMPROVE THE ACCEPTANCE OF VACCINE

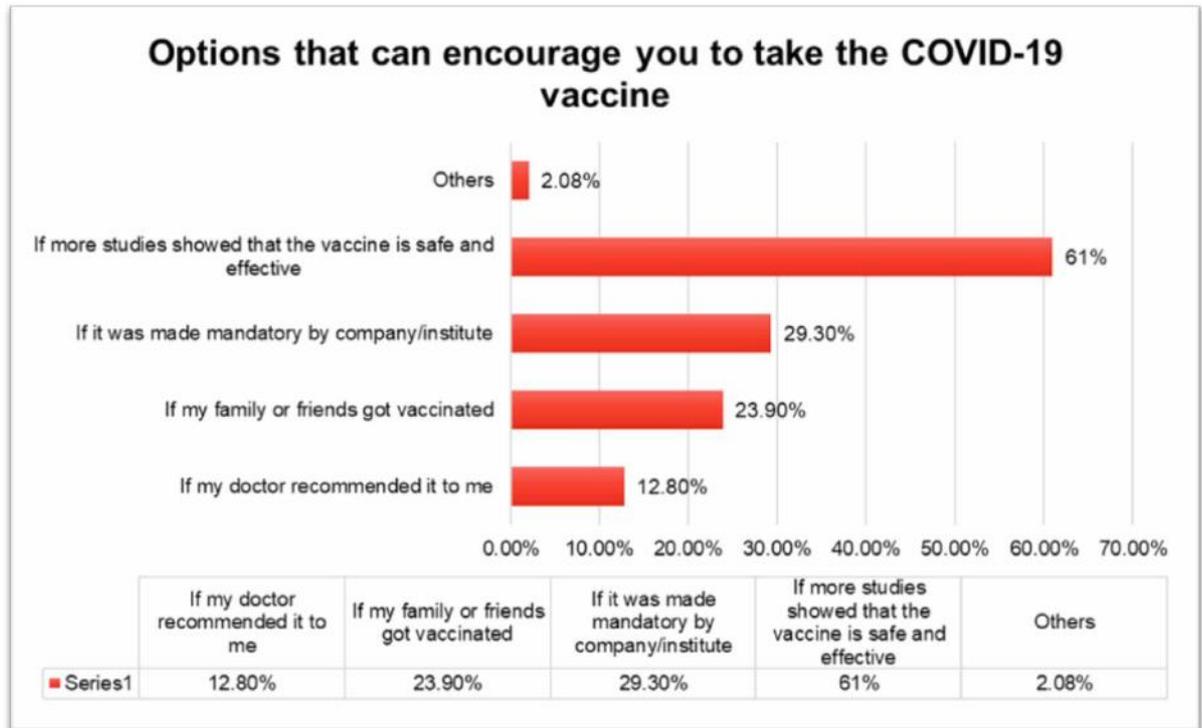


Figure 4.3: The response of participants regarding the factors that can encourage them to take COVID-19 vaccination. The cumulative percentages exceeded beyond 100% since the participants can choose more than one answer

Using a single question with various responses, the factors that can induce participants to take the COVID-19 vaccine were investigated. About 61% believed the increase in studies that showed the effectiveness and safety of COVID-19 vaccine could increase the level of acceptance. More than 29% thought that making vaccination mandatory in institutes would improve its acceptance. 23.80% responded that family or friends getting vaccinated would increase their acceptance. 12.80% agree that their doctors recommendation would improve the level of acceptance of the COVID vaccine, and 2.08% think there are other options to encourage people to get vaccinated.

## 4.6 COMPARATIVE STUDY

### 4.6.1 Relation between education and acceptance of COVID-19 vaccine

$H_0$ : There is no relationship between education and acceptance of COVID-19 vaccine.

$H_1$ : There is relationship between education and acceptance of COVID-19 vaccine.

Critical value = 0.05

If p-value is greater than 0.05, we accept  $H_0$

If p-value is less than 0.05, we accept  $H_1$

Preference	SSLC or Less	Plus two	UG/Graduation	Post Graduation	Total
Yes	12	87	148	12	259
No	8	9	13	1	31
Total	20	96	161	13	290

Table 4.1: Observed frequency

Preference	SSLC or Less	Plus two	UG/Graduation	Post Graduation	Total
Yes	17.86206897	86.10309278	143.7896552	11.61034483	259
No	2.137931034	10.26206897	17.21034483	1.389655172	31
Total	20	99	161	13	290

Table 4.2: Expected frequency

Here,

p-value = 0.000221972 < 0.05

Therefore we reject  $H_0$  and accept  $H_1$ .

There is relationship between education and acceptance of Covid-19 vaccine. Acceptance of Covid-19 vaccine is more among educated people.

### 4.6.2 Relation between residence and acceptance of COVID-19 vaccine

$H_0$ : There is no relationship between residence and acceptance of COVID-19 vaccine.

$H_1$ : There is relationship between residence and acceptance of COVID-19 vaccine.

Critical value = 0.05

Preference	Urban	Rural	Total
Yes	136	118	254
No	114	76	190
Total	250	194	444

Table 4.3: Observed frequency

Preference	Urban	Rural	Total
Yes	143.018018	110.981982	254
No	106.981982	83.01801802	190
Total	250	194	444

Table 4.4: Expected frequency

Here,

p-value = 0.174736974 > 0.05

Therefore we accept  $H_0$

There is no relationship between residence and acceptance of COVID-19 vaccine.

Vaccine acceptance is similar in both urban and rural areas.

### 4.6.3 Relation between taking the vaccine and vaccine being legally mandatory

$H_0$ : There is no relationship between taking the vaccine and vaccine being legally mandatory.

$H_1$ : There is relationship between taking the vaccine and vaccine being legally mandatory.

Critical value = 0.05

Preference	Legally Mandatory	Not Mandatory	Total
Yes	287	128	415
No	22	7	29
Total	309	135	444

Table 4.5: Observed frequency

Preference	Legally Mandatory	Not Mandatory	Total
Yes	288.8175676	126.1824324	415
No	20.18243243	8.817567568	29
Total	309	135	444

Table 4.6: Expected frequency

Here,

p-value = 0.44790057 > 0.05

Therefore we accept  $H_0$

That is there is no relationship between uptake of vaccine and vaccine being legally mandatory.

#### 4.6.4 Relation between occupation and acceptance of COVID-19 vaccine

$H_0$ : There is no relationship between occupation and acceptance of COVID-19 vaccine.

$H_1$ : There is relationship between occupation and acceptance of COVID-19 vaccine.

Critical value = 0.05

Preference	Government Job	Private Job	Student	Unemployed	Total
Yes	12	54	329	20	415
No	1	4	22	2	29
Total	13	58	351	22	444

Table 4.7: Observed frequency

Preference	Government Job	Private Job	Student	Unemployed	Total
Yes	12.1509009	54.21171171	328.0743243	20.56306306	415
No	0.849099099	3.788288288	22.92567568	1.436936937	29
Total	13	58	351	22	444

Table 4.8: Expected frequency

Here,

p-value = 0.956724923 > 0.05

Therefore we accept  $H_0$

There is no relationship between occupation and acceptance of Covid 19 vaccine.

Occupation is not a requirement for vaccination uptake.

## Chapter 5

# CONCLUSION

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Vaccination is considered the most significant achievement in public health. They need to be produced on an immense scale, priced affordably, and allocated globally so that they are available where and when required. Another major challenge is public confidence and acceptance. Many factors, like geography, time, social class, contextual human behavior, and ethnicity, are affecting public confidence and acceptance of vaccination. This study was conducted to assess the public's acceptance and concerns regarding vaccination against COVID-19 disease.

A total of 444 people participated in the survey. Approximately 93.4% were vaccinated, while 6.6% were not. At present, the number of studies regarding the COVID-19 vaccine acceptance is limited, although several studies are being conducted all around the world. Our results indicate that vaccine acceptance is 86.3%, which is in accordance with the results obtained from the studies conducted in Kerala. The study conducted in Kerala reported that 84% were vaccinated and 16% were not vaccinated among the general population. In this study, they also used chi-square to find the acceptance of the COVID-19 vaccine. The study conducted in Kerala, which shows a positive attitude towards vaccination, was reassembled with our study.

The major reasons for the hesitancy reported by those unwilling to take the vaccine are anxiety about the adverse reactions and concerns regarding the efficiency of the vaccine. In our study also, the major reason for hesitancy was anxiety about the side effects of the COVID-19 vaccine. In another study conducted in

India, 55.6% believe that the COVID vaccination is safe and 46.2% believe that it will be effective. In our study, 59.9% believe that COVID-19 vaccination is safe and 57.9% believe it will be effective. 51.8% agreed that vaccination is the best immunisation method against COVID-19, and the study in India reported that vaccination is the best way to avoid the complications of COVID-19 disease.

In terms of vaccination acceptance techniques, we discovered that more people are concerned about vaccine safety and efficacy. Based on the general response, more individuals will accept vaccines if further studies are undertaken to evaluate their usefulness and safety. The current study has certain limitations because it was conducted utilising an online self-administered questionnaire. Several factors, such as internet accessibility and social media platform access, may have a direct impact on the survey population. To begin with, the study sample was primarily composed of people between the ages of 19 and 29. It's possible that a large amount of the "not sure" responses to vaccine views are attributable to widespread vaccination rumours. Another drawback of the study was that responses were recorded electronically using sophisticated methods that are not popular among senior citizens.

The study reveals a good level of acceptance regarding vaccination among the population study. The study's main findings can be used to help organise vaccination efforts. Concerns about the acceptance of COVID-19 vaccinations were discovered by the study, offering a crucial perspective for prospective interventional educational programmes to improve immunisation rates. Concerns about vaccination adverse effects were also highlighted as a major obstacle to vaccine adoption, according to the study. The quick development of the COVID-19 vaccine could have contributed to the establishment of public concerns. These worries have the potential to stymie the scientific community's progress by preventing the vaccine from being widely distributed. Furthermore, if additional studies can validate the safety and effectiveness of current vaccine candidates, vaccine acceptance can be raised among the community.

The study shows the positive attitude towards Covid-19 vaccine. It also identi-

fies the existence of a relation between education and acceptance of the vaccine. As people have better knowledge about the vigorous impact of COVID, they consider vaccination as an essential tool. Also, COVID 19 rattled everyone irrespective of their place of residence. The fear of getting affected by COVID is also universal. So there is no relation between the acceptance of COVID vaccine and the place of residence. Even though vaccination is legally mandatory, it doesn't affect the acceptance rate. The study also shows that there is no relationship between occupation and vaccine acceptance. This means that everyone, whether a student, an employee, or an unemployed person, accepts the COVID-19 vaccine equally. The major concerns from the respondents were about the unavailability of free vaccines and its side effects. Due to unavailability, and people's assumptions about the side effects, people tend not to get vaccinated. The study also identifies the key barrier for the acceptance of COVID vaccine is the concerns regarding its side effects.

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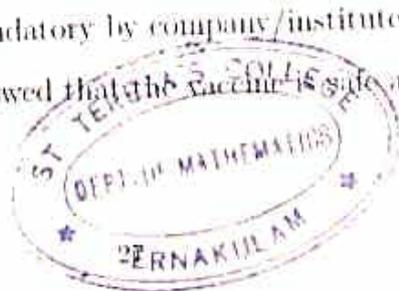
# ANNEXURE

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## QUESTIONNAIRE :

1. Gender
  - Male
  - Female
2. Age
3. Type of residence
  - Urban
  - Rural
4. Your educational qualification
  - SSLC or Less
  - Plus Two (Pre-degree)
  - Plus Two (Pre-degree)
  - Post Graduation
  - Other
5. Your Occupational status
  - Student
  - Unemployed
  - Private Job
  - Government Job
6. Your Annual Income
7. Have you taken the COVID - 19 vaccine?
  - Yes (first dose)
  - Yes (taken both doses)
  - No
8. Are you planning to take the COVID-19 vaccine if you have not taken it yet?
  - Yes

- No
9. Did you take or is planning to get the COVID-19 vaccine because it is legally mandatory?
- Yes
  - No
10. Do you believe that the COVID-19 vaccine is safe?
- Yes
  - No
  - Not sure
11. Do you believe that the COVID-19 vaccine is effective?
- Yes
  - No
  - Not sure
12. Do you believe that getting vaccinated is the best method to prevent COVID-19 complications?
- Yes
  - No
  - Not sure
13. Options that prevent you from taking the COVID-19 vaccine.
- I am concerned about the vaccine's side effects
  - Lack of availability of free vaccine
  - I don't need the vaccine because I follow preventive measures seriously
  - I am afraid of needles and injections
  - Other
14. Options that can encourage you to take the COVID-19 vaccine.
- If my doctor recommended it to me
  - If my family or friends got vaccinated
  - If it was made mandatory by company/institute
  - If more studies showed that the vaccine is safe and effective
  - Other



**A Study of Religiosity and Attitude Towards Homosexuality Among  
Indian Adults**

Dissertation submitted in partial fulfilment of the requirements for the award of

Master of Science in Psychology

By

**Lakshmi K J**

**Register No: SM20PSY010**

Under the guidance of

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**ST. TERESA'S COLLEGE (AUTONOMOUS), ERNAKULAM**

Nationally Re-accredited at 'A++' level (4th cycle)

Affiliated to: Mahatma Gandhi University

**MARCH 2022**

**CERTIFICATE**

This is to certify that the dissertation entitled, “Study of Religiosity and Attitude Towards Homosexuality Among Indian Adults”, is a bonafide record submitted by Ms. Lakshmi KJ, Reg.no. SM20PSY010, of St. Teresa’s College, Ernakulam under my supervision and guidance and that it has not been submitted to any other university or institution for the award of any degree or diploma, fellowship, title or recognition before.

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**DECLARATION**

I, LAKSHMI K J, hereby declare that this project is an authentic record of original study carried out by me under the guidance of **Ms, ANJITHA VENUGOPAL** Assistant Professor, Department of Psychology, ST. TERESA'S COLLEGE, ERNAKULAM and no part of the dissertation has been presented earlier for any degree, diploma course or title in any of the universities

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LAKSHMI K J

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**LAKSHMI K J**

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### **ABSTRACT**

The aim of the present study was to study the religiosity and attitude towards homosexuality among Indian adults. A total of 112 men and women participants were selected as sample. Random sampling method was used. The centrality of religiosity scale (CRS) and homosexuality attitude scale (HAS) questionnaires were used for collecting data. The data were analysed using descriptive analysis, student's t-test and Pearson correlation. Results reveal that there exists significant difference between religiosity and level of homosexuality attitude among men and women. That implies men are more religious than women and women has more anxiety and misconception about homosexuals. Correlation analysis of data revealed that there exists no significant relationship between the variables.

**Key words:** Religiosity, Homosexuals

## **CHAPTER I**

### **INTRODUCTION**

## **Study of Religiosity and Attitude Towards Homosexuality Among Indian Adults**

In simple term, religiosity may be referred to as the state of one's belief in God, characterized by his piety and religious zeal. The higher his piety and religious zeal are, hence the stronger his belief in God, the higher his religiosity is. But what seem to be synonymous with religiosity - for instance religiousness, orthodoxy, faith, belief, piousness, devotion, and holiness.

The degree to which a person uses adheres to his or her religious values, beliefs and practices and uses them in daily living. The supposition is that a highly religious person will evaluate the world through religious schemas and thus will integrate his or her religion into much of his or her life. (Worthington et al.2003, )

Religiosity or religious commitment is "the extent to which an individual's committed to the religion he or she professes and its teachings, such as the individual attitudes and behaviours reflect this commitment" (Johnson, Jang, Larson and Li, 1995)

### **Major religion and their basic philosophy**

#### ***Hinduism***

Hinduism, one of the oldest living religions, with a history stretching from around the second millennium B.C. to the present, is India's indigenous religious and cultural system. It encompasses broad spectrum of philosophies ranging from pluralistic theism to absolute monism. Hinduism is not a homogeneous, organised system. It has no founder and no single code of beliefs; it has no central headquarters; it never had any religious organisation that wielded temporal power over its followers. Hinduism does not have a single scripture as the source of its various teachings. It is diverse; no single doctrine (or set of beliefs) can represent its numerous traditions.

Hindu religious life might take the form of devotion to god or gods, the duties of family life or concentrated meditation. Many Hindu call their tradition Santana-dharma, the eternal law that governs everyone irrespective of belief. It is believed that these truths regarding the universal law were divinely revealed to ancient sages. Hinduism is a synthesis of religion and philosophy; as also a way of life.

### ***Islam***

Over one billion people are active Muslims throughout the continents of the world. This religion was revealed to mankind by Allah, the Alone God, through the many human messengers-prophets in history. They believe the final revelation was given to the Prophet Muhammad who lived from 570-632 C.E. Attached to his name is a blessing that is often used after the names of honoured prophets.

A Muslim is someone who has surrendered their whole being to God and committed themselves to pattern their life on his divine guidance that he communicated to the human messenger-prophets. Islam is embodied in the Qur'an and in the Sunnah, which are the actions, sayings, and approvals of the Prophet Muhammad. In the Qur'an, Islam is described as the primordial or natural religion of the innate nature with which Allah created mankind (Qur'an 30:30), and as the religion which was completed and consummated in the Qur'an, the final definitive Divine Writ from Allah.

### ***Christianity***

Christianity is the name given to that definite system of religious beliefs and practices, which were derived from the teachings of Jesus Christ in the country of Palestine, during the reign of the Roman Emperor, Tiberius. According to the accepted tradition, the day of Pentecost, in A.D. 29, is regarded, as the beginning of the Christian religion. Thus, Christianity is a religion of the people who follow Jesus the Christ. In

our effort to understand the meaning of Christianity, we examine three aspects: (1) A set of beliefs, (2) a way of life and (3) a community of people. Different Christian groups or denominations place different levels or provide varying degrees of importance on these three aspects, but they always involve all three. All the three aspects are based on the life and teachings of Jesus of Nazareth, who is also known as the Christ.

### *Dimensions Of Religiosity*

Putley and Middleton (1961) tried to analyse the dimensions of religious ideology by focusing on four dimensions: (1) Orthodoxy; (2) Fanaticism; (imposing religion on others); (3) Importance (personal significance of religion) and (4) Ambivalence (awareness of holding contradictory attitudes towards religion).

Homosexuality is a feeling or desire involving sexual attraction to people of one's own sex. In common usage, the term homosexual is used to refer to both same-sex oriented males and females. The word 'Gay' is often used as a synonym for male homosexual behaviour while the term 'Lesbian' is referred to a woman who is sexually attracted to another woman. In terms of sexual orientation of individuals, a bisexual person is sexually attracted to both men and women. Gays and lesbians emphasise the cultural, social and identity aspects of homosexuality.

The word 'Gay' is associated with several stereotypical images and ideas, like the way they act and dress. Thus, whether correct or not, we have a certain awareness of gays in our consciousness, like feminine men wearing tight, leopard prints. However, there is no real image of lesbians in our consciousness. They are denied any kind of identity and it could just as well be that they don't exist at all. This is another kind of

silencing that we see taking place. Lesbian women cannot speak for themselves, because according to society, they don't exist at all.

Female sexuality has always been as taboo-something not to be discussed, something which is a matter of the "domestic sphere". This new angle to female sexuality will obviously be hard to accept. Furthermore, this also punctures male supremacy as the need for the males get rejected here. Women are forcibly married off to men so as to "cure" them. They are suffocated by ideological discourses and glorified expectations of women as custodians of "morals, tradition and culture".

Sigmund Freud (1850-1939) spoke of religion as an illusion in "The Future of Illusion". He maintained that religion is a fantasy structure, from which a man must be set free, if he is to grow to maturity. Freud views the idea of God as being a version of the father image, and religious belief as an act that is infantile and neurotic. Authoritarian religion is dysfunctional and alienates man from himself.

Carl Jung (1875-1961) adopted a more sympathetic posture to religion with a positive appreciation of religious symbolism. Jung considered the question of the existence of God to be unanswerable by the psychologists and adopted a kind of agnosticism.

Gordon Allport (1897-1967) in his classical book, "The Individual and His Religion" (1950) illustrates how people may use religion in different ways. He makes a distinction between "mature religion" and "immature religion". More recently, this distinction has been encapsulated in terms of "intrinsic religion" and "extrinsic religion".

Eric Erickson (1902-1994) revealed religion as an important factor which influences the personality development because they are the primary ways cultures

promote the virtues associated with each stage of life. Religious rituals facilitate this development.

Erich Fromm (1900-1980) estimated that religion can foster individuals' highest potentialities, but religion in practice tends to relapse into being neurotic. Human beings are always in a need for a stable frame of reference, religion fills this need. In effect, humans carve answers to questions that no other source of knowledge has an answer to, which only religion may seem to answer. However, a sense of free will must be given in order for religion to appear healthy. An authoritarian notion of religion appears detrimental.

Since long it is a topic of debate whether religiosity is determined by genes or by environment. Studies conducted on twins (Bouchard et al.1999; Kirk et al. 1999; Koenig et al. 2005) have reported that religiosity becomes more determined as we age. Environmental factors, like attending religious ceremonies with family affect our religiosity as children, but genes most likely keep us attending and believing, as we become adults. During the transition from adolescence to adulthood, genetic factors increase from 12% to 44% while shared environmental factors decrease from 56% to 18%. An analysis of self- reported religiosity showed that monozygotic twins maintained their religious similarity over time, while dyzygotic twins become more dissimilar. These correlations suggest low genetic and high environmental influences when the twins were young but a larger genetic influence as the twins age.

Although modernity has caused a degree of rupture between religion and society, there has been a global revival of religion in the last three decades. There exists a great variation among the world religions over the issue of how religiosity is manifested or what are the core dimensions of religiosity.

### *Homosexuality in India*

Homosexual people were somehow excluded or left unnoticed by Indian ancient Vedic civilization and its Sanskrit texts is neither reasonable nor fair to that great culture. India's ancient literatures are comprised of voluminous texts and their priestly authors were all known for their detailed accounts of all sciences, both godly and mundane. It is highly unlikely that they would omit or overlook any aspect of human nature. Rather we see in the Kama shastra full accounts of both men and women who had "Tritiya-prabriti" or "third-sexed" by nature and described as homosexually.

The present day "hijra or "eunch" class of Northern India is unquestionably comprised largely of homosexual and transgendered people, with only very few who are truly intersexed. This has been documented through years of research and personal interviews conducted by professionals like Dr. Serena Nanda, the professor of Anthropology for the City University of New York. In her book "THE HIJRA OF INDIA". Sinhas (1967) study of hijra in Lucknow, in North India, acknowledges the hijra role as performers, but view the major motivation for recruitment to the hijra community as the satisfaction of the individual's homosexual urges.

Homosexuality is generally considered a taboo subject by both Indian civil society and the government. Public discussion of homosexuality in India has been inhibited by the fact that sexuality in any form is rarely discussed openly. In recent years, however, attitudes towards homosexuality have shifted slightly. In particular, there have been more depictions and discussion of homosexuality in the Indian news media and by Bollywood. On 2 July, 2009, Delhi High Court, decriminalised homosexual intercourse between consenting adults and judged section 377 of 'the

Indian Penal code to be conflicting with the fundamental rights guaranteed by the Constitution of India.

Religion has played a significant role in shaping Indian customs and traditions. While homosexuality has not been explicitly mentioned in the religious texts central to Hinduism the largest religion in India, some interpretations have been viewed as condemning homosexuality. Scholars differ in their views of the position of homosexuality within India's main religious traditions. There have been arguments that homosexuality was both prevalent and accepted in ancient Hindu society.

The Manu smriti, which lists the oldest codes of conduct that were proposed to be followed by a Hindu, does include mention of homosexual practices, but only as something to be regulated. Though homosexuality was considered a part of sexual practices, it was not always well accepted. There were punishments prescribed for homosexual behaviour, for instance, the verse referring to sexual relations between an older woman and a virgin (woman) reads".... a woman who pollutes a damsel (virgin) shall instantly have (her head) shaved or two fingers cut off, and be made to ride (through the town) on a donkey", suggesting a severe punishment. However, the verse referring to sexual relationship between two virgins suggests a relatively milder punishment" ... a damsel who pollutes (another) damsel must be fined two hundred (panas), pay the double of her (nuptial) fee, and receive ten (lashes with a) rod".

Warren Gadpaille (1995) has classified homosexuality, in addition to adult preferential homosexuality, into following types.

### ***Developmental homosexuality***

This is the homosexuality that can occur in both boys and girls at any immature stage of development. The homosexual or homoerotic activity is usually part of normal

development and is not prognostic of adult homosexuality. Kinsey found that it was more common than heteroerotic play in girls up to age 13 and in boys up to age 15 and that 33 percent of women and 50 percent of men reported such play by age 15.

### ***Situational homosexuality***

This homosexuality is generally induced in the nonavailability of opposite-sex members. The absence of opposite-sex partners in some situations or environments such as unisex boarding schools or hostels, prisons and some military stations induce some preferential heterosexuals to turn to same sex partners until they return to normal environments. Some have regarded it as a healthy adaptation; for mutually consenting persons it is usually not harmful.

### ***Exploitative and enforced homosexuality***

As in heterosexual rape, the penis can be used as a weapon and as an assertion of dominance and power against other man. Homosexual rape is frequent in prison populations but is not limited to places where violence is endemic, those with the power to intimidate; often coerce the weak and fearful into being recipient sexual partners, usually in anal intercourse and sometimes in fellatio. Sexual release is not the main emotional goal. The exploiters, sometimes, do not consider themselves homosexuals. The trauma to an exploited partner's sexual and social self-concept can be shattering. Such experience usually do not result in subsequent homosexuality, but in some cases the victims became homosexual, even they had no prior awareness of homosexual feelings.

### ***Bisexuality and ambisexuality***

Homosexuals usually have heterosexual experiences. Those who have some degree of ongoing coital experience are often regarded as bisexual, but close attention

to their erotic fantasies and differential arousal response generally reveals that their erotic preference is homosexual. True ambisexuality, equal arousal and pleasure with partners of either sex is apparently rare.

'SEX A-Z', a comprehensive dictionary of sex and sexology authored by Robert Goldenson and Kenneth Anderson and published by Bloomsbury Publishing Limited, London (1992) gives a long list of the types of homosexuality and homosexuals. The list includes accidental homosexuality, adolescent homosexuality, covert homosexual, derivational homosexuality, effeminate homosexuality, iatrogenic homosexuality, latent homosexuality, masked homosexuality, overt homosexuality, primary homosexual, pseudo homosexuality and situational homosexuality.

### ***Accidental Homosexuality***

Is male or female homosexuality in Which the partner is chosen when no person or the opposite sex is available. Adolescent homosexuality is homosexual contacts, usually Involving orgasm during adolescence. Survey. s b)' Kinsev and others have indicated that about 17 percent of women homosexuals and about 18 percent of male homosexuals experienced their first coitus before the age of 15. In most cases, however, homosexual contacts during adolescence are occasional and experimental, and may not lead to a pattern of homosexuality in adult life.

### ***Covert Homosexual***

Is a homosexual who conceals his or her homosexuality from fellow workers and many social contacts although other homosexuals are aware of the person's true sexuality.

***Deprivational Homosexuality***

Is an alternative term for situational homosexuality or homosexual behaviour that develops because of an absence of heterosexual outlets.

***Effeminate Homosexuality***

It is a male homosexual pattern characterized by adoption of the gestures, voice inflection, and mannerisms often associated with femininity. Effeminate homosexuals may also dress in women's clothes and assume the passive role in intercourse.

***Iatrogenic Homosexuality***

It is a doctor induced homosexuality; Homosexual desires or behaviour resulting from the close relationship developed between doctor and patient during psychotherapy or psychoanalysis.

***Masked Homosexuality***

it is unconscious homosexuality, which may take many forms; exclusive preference for sexual acts usually engaged in by homosexuals, such as anal intercourse with members of the opposite sex, also according to the psychoanalyst Wilhelm Stekel, sexual relations with old women or sexual desire directed to children.

***Overt Homosexuality***

Is homosexuality that is consciously recognized and expressed in sexual behavior as distinguished from unconscious homosexual impulses or desires, or conscious wish that are held in check.

***Primary Homosexual***

It is a person who has manifested distinct homosexual tendencies in early childhood or youth, as contrasted with a person who has become homosexual as a response to circumstances or outside influences. The latter is sometimes called secondary homosexual.

***Pseudo Homosexuality***

It is homosexuality motivated by nonsexual feelings of dependence and power in addition to the basic desire for sexual gratification and pleasure.

***Adulthood***

Adulthood is the longest period in the life span and is subdivided into three periods viz, early adulthood, middle adulthood, late adulthood. Early adulthood extends from 18 or 20 years to approximately 40 years. It is the period during which people assume seriousness and take responsibilities of adult life. They have to decide upon many things and make the choice of careers and life mates. So, it is the period of settling down and it is reproductive age. It is a time of social isolation, commitment, dependency, value changes, creativity etc., because they have to make adjustments related to marriage, parenthood and jobs. Since they assume new patterns of behaviour, their responsibilities increase and commitment become stronger. But they may be often partly or fully dependent on others; may be on parents or other institutes. Their egocentric value also changes and they try fit into social norms.

Their social activities are greatly blocked because of occasional family pressures. As a result, many young adults' experiences what Erikson called as isolation crisis a time of loneliness, due to isolation from social group. Social participation is limited during this period. Social mobility changes in men, mainly through their own

efforts. Nevertheless, in females it comes through marriage to men or through their own achievements. The interplay of heredity and environment can be seen in terms of sex differences and sex roles in developmental stages and some of the issues faced by adolescents and adult's results in several kind of conflicts. Kurt Lewin (1930) explains conflicts as operation of two incompatible goals in terms of two opposite tendencies; approach and avoidance. In approach-avoidance conflict, the individual is simultaneously attracted to and repelled by a single goal object. People whose parents taught them that sex is dirty is sinful, may find themselves simultaneously attracted to and repelled by members of the opposite sex.

### ***Need and significance of the study***

Religiosity refers to people's varying tendencies to commit themselves to religious beliefs, principles, and activities. Kerala has a reputation of being, communally, one of the most religiously diverse states in India. Religion forces people to rely on outside authority, rather than becoming self-reliant. Religion imposes irrational rules of good and bad behaviour. Religion divides people, and is a cause of conflicts and rejections.

Homosexuality refers to the "experience of exclusive or nearly exclusive erotic preferences for others of the same sex in fantasy and, characteristically, through the realization of sexual intimacy with others of the same sex." The prevalence of homosexuality is difficult to estimate for many reasons, including the associated stigma and social repression, the unrepresentative samples surveyed and the failure to distinguish desire, behaviour and identity. The figures vary between age groups, regions and cultures. Even though 30% of Indian respondents broadly supportive of homosexuality. Also 6 in 10 youth still view homosexuality.

The need of the study is to study the religiosity and attitude towards homosexuality among adults. And why they show rejections towards that minority group. Lot of review literature contains several studies discussing about this, but none have examined the relationship of religiosity and homosexuality in Thrissur and Ernakulam districts.

More recently, public opinion has increasingly opposed sexual orientation discrimination, but expressions of hostility toward lesbians and gay men remain common in contemporary. Severe antigay prejudice is reflected in the high rate of harassment and violence directed toward lesbian, gay. In such situations these studies help to understand the attitude towards homosexuality influence, how people interact with members in this community. And to understand people religiosity influence in their opinion about homosexuality. The findings of this study can be helpful to understand the exclusion or negative attitude towards homosexuals, it leads to psychological problems to them, like depression, anxiety, social isolation etc. so, we can provide proper awareness to women as well as men in our society. Based on results, we can give early awareness classes from the school. Through that they can accept and understand homosexuals. Majority of Malayali's can't accept homosexuals based on their tradition, culture and religious values but out of Kerala they have support and opportunities to life so we can change attitude of people through campaign and counselling. As well as it can do further studies on the same topic by adding more variables such as mass media, environmental influence and peer support etc.

## **CHAPTER II**

### **REVIEW OF LITERATURE**

Religiosity is the peoples varying tendencies to commit themselves to religious beliefs, principles and activities. There is strong relationship of religion to adjustment. It found that the amount of health, home, social and emotional areas is high in religious persons in a positive way (Bhusan 1970). These results are similar to those of Hayo (1970) Williams, suttee (1968), Wilson (1963) Butt (1978) and Brown (1966) reported that in religious persons anxiety, depression, neurotic disorders are high in as compared to persons with low religiosity.

A study by Hand way (1978) on religiosity concluded that religion is our potential resource in peoples' lives. More recently Myers and Diener (1995) in their survey of related studies observe that links between religion and mental health are impressive and that culture and religiosity may provide better clues to understanding the nature of well-being. Gartner J. et al (1991) have reviewed relation between religious commitment and psychopathy. Mixed findings were given. In a recent meta-analysis Bergin (1983) found that 23 % of the studies reported a negative relationship, 43% reported a positive relationship and 30% reported no relationship. Much of the credibility established by the field in the recent years can be attributed to the literature showing the relationship of religion and spirituality with mental health (Gartner, 1996, ventis 1995) and physical health (Mc cullough, 1999, Dull & Skokan, 1995, Hill & Butter, 1995) which substantially established the link. Though the relationship is complex, with religion and spirituality correlating both positively and negatively with mental and physical health, the positive benefits of religion and spirituality seen to outweigh the negative (Bergin 1983, Payne et al, 1991). Jensen, Larry C. & Jensen Janet (1993), examined "Family values, religiosity and gender." They investigated differences between men and women on their perception of materialism, the importance of the family and the traditional female role. A questionnaire was administered to over

4000 protestant, catholic, and LDS college students. Higher religious group from each denomination endorsed less materialistic views, supported a more traditional female role, and placed a higher value on the importance of the family. Gender differences were greater in the group low on religiosity. Locus of control measures was correlated with Religious Problem Solving and Religious Orientation Scale. 19 to 20 locus of control items were pro-religious and some were antireligious by Watson P.J., Milliron, J. Trevor., Morris Ronald J., & Hord Ralf, W. (1995), University of Tennessee, Dept. of psychology, Chattanooga. Sayed Firoj Ali, and Karunanidhi S. (1995), conducted a study on "Religiosity and Value." And the results of the study revealed that those who are high on religiosity were found to be traditional in their values where as low religiosity people were modern in their values. Woodhead (2000) conducted a study on "the gender differences in religious practice." she mentioned that religion showed a significant influence on gender, significant gender difference in religious practices was observed. Religion and gender hold unequal distribution of power which is reflected in almost all aspects of social situation. Therefore, changes in religious concepts towards gender equality and in society can make positive impact on gender. Religion plays major role in defining gender norms and rules. The religious people in turn follow the religious gender concepts. Penny. (2005) conducted a study on that "explored the effect of personality on gender differences in religiosity". A total number of 1682 students (between 20 and 29 age) from Wales participated in the study. Women measured higher in religiosity than men within Christian and Post-Christian contexts. At the same time it was indicated that the individual differences in religiosity was significantly influenced by psychoticism personality type. Thus, it can be safely concluded that the gender difference in religiosity might be due to personality factors such as level of psychoticism. At the same time the psychological femininity is positively correlated

with religiosity. Thus, it can be concluded as personality mediates the influence of religiosity.

The study of Seguino (2011) the impact of religion on gender inequality and attitude towards gender equality. The data were collected from the World Values Survey (WVS) conducted on 300000 participants from all around the world (97 countries). The result revealed that religion has a significant role in gender inequality among people. Every religion project gender inequitable views. Further, it was observed that men hold a high level of gender inequitable attitude. However, individuals who are economically well and educated tend to show more gender equitable views. Thus, the role of education towards gender equitable view is inevitable. At same time, trends show that the higher-income countries have more gender equitable attitude. Individuals who participate more in religious rituals and believe religion intensely hold high gender inequitable view. The results of Kajawo (2012) enhance the religion plays a significant role in gender equality and women empowerment. Religious organizations confirm gender equality and religion shapes attitude and behavior of people. Thus, the religion can up bring women to the mainstream. Therefore, religious institutions should take initiation to promote women empowerment and egalitarian gender roles.

Woodhead (2013) explored the gender differences in religious practice. Religion and gender hold unequal distribution of power which is reflected in almost all aspects of social situation. Therefore, changes in religious concepts towards gender equality and in society can make positive impact on gender. Religion plays major role in defining gender norms and rules. The religious people in turn follow the religious gender concepts. Chaudhary (2015) explored the personal law of Hindus and Muslims in India which often led to gender inequality. The men and women who follow Islam

have the tendency to build a concept that men are superior and women are subordinate. Chaudhary repeated that people give more importance to religious norms and laws than the civil laws. Thus, the importance of uniform civil code for all religion is important. As education can make lots of changes in the society women should not be deprived of education. Chadee, Joseph, Peters, et al (2021), conducted a study on “religious attitude and environmental influence “it was found that in a multi-religious environment as well, the ones who were highly religious tended to display intolerance towards homosexuality. Since it is common to assume that the young adults would be more accepting of homosexuality as compared to adults.

Homosexuality is a feeling or desire involving sexual attraction to people of one’s own sex. In common usage, the term homosexual is used to refer to both same-sex oriented males and females. Kremer and Rifkin (1969), conducted a study on “adolescent female homosexual patients” It found that the fathers of homosexual females were reported not as close binding but rather, as hostile, exploitative, detached, and absent. In the same study, the mothers are described as overburdened and inadequate. In one study, Grundlach and Riess (1968) concluded that the parents of homosexual females were not different from those of the heterosexual females. And, with an English same, Kenyon (1968) found that homosexual women, compared with heterosexual women, had poorer relationships with their fathers as well as their mothers. Siegelman (1974) studied “the parental background of homosexual and heterosexual women.” The lesbians, when compared with heterosexuals, described their fathers as less loving and more rejecting. They described Their mothers also were less loving and more demanding but reported no differences in rejection. They also reported less closeness to their fathers and mothers, less family security, and more interparent friction.

Raymond M. Bergerl (1995), "Gay and Grey, The Older Homosexual Men," Haworth Press: Gay Studies Books; A scholarly treatment of gay men aged 40 and older in America based on an intensive interview and questionnaire study. The first two sections cover the interview of the respondents and results from the study. results from other studies concerning age status labelling, sexual attitudes and behaviour in midlife and other topic. Ruth Vanita (2002), "Queering India: Same Sex Love in Indian Culture and Society," London: Routledge, covers a wide range of topics covering films, literature, popular culture, historical and religious texts, law and other related aspects of life in India. It provides a profoundly new understanding of gays and lesbians in Indian society.

Gough; Herek; Raja & Stokes (2002;2002;1998, as cited in Moskowitz, et al., 2012) conducted a study on "consistently shows men to be more homophobic than women." Heterosexual females are substantially more understanding and compassionate of gays and lesbians than are heterosexual males. They are more likely to be proponents of employment, adoption, and civil rights and less likely to hold negative stereotypical beliefs about the population. Heterosexual men are least supportive of these same aspects. These men are more likely to believe that homosexuals are mentally ill, sexual predators or child molesters, and generally more likely to fit negative stereotypical preconceptions. Homophobia seemed to be the most influential variable with respect to attitudes toward gay male and lesbian marriage.

S. Lehrman (2005) conducted a study on different geographical and social conditions divulged "the severity of sexual health status of the homosexuals". They found that, homosexual individuals using contract syphilis at a rate three to four times higher than non-homosexuals. Anal intercourse causes haemorrhoids, anal fissures, anorectal

trauma, and retained foreign bodies, and creates high risk for anal cancer. Among male homosexuals engaging in oral-to-anal contact, an extremely high rate of parasitic and other intestinal infections exists. Emman Bernay (2008), "Homosexuality," New York: Greenharen Press. The book is a comprehensive treatise on homosexuality and differentiates between various nuances of homosexuality. It emphasises that Gay refers to all members of LGBT community and is not sex specific. It argues that the term homosexual does not explain the complete concept. The word refers only to sexual behaviour rather than complex romantic feelings between members of the same sex. Shayeslekhhou et al., (2008) explored the family environment of homosexuals in Iran. Findings show that most families are disorganized and conflict oriented which clearly reflects the effect of stigmatization of being homosexual. This will put a lot of pressure on homosexual, putting them in danger of developing serious mental health problems. Kissinger et al., (2009) conducted a study on the impact of family environment on future mental health professionals, attitude towards gay men and lesbian found that family dimensions such as conflict, intellectual cultural orientation, and more religious emphasis significantly predicted the attitude towards gay men and lesbians. The study also revealed that younger students held more negative attitude towards gay men. Shenkman & Shmotkin (2011) examined the mental health status of Israeli homosexuals in adolescence and early adulthood in comparison to heterosexual controls and found that the homosexual participants reported more depressive symptoms and more negative affect than matched heterosexuals. Granados & Delgado, (2007) and Ortíz Hernández, (2005) gay men's emotionality is relevant when feelings are considered basic aspects of certain mental health issues, such as anxiety, depression. Gay adolescents were twice as likely to have thought of or attempted suicide. Gay

adolescents were twice as likely to have been physically abused and nearly six times more likely to have been sexually abused (Barney, 2008).

Furthermore, study of Patio et al., (2014), examined family rejection in homosexual by family in a primary health care unit found that family has a negative attitude toward homosexuality and there was a great feeling of family dishonor to have a homosexual son or daughter. Increased psychiatric morbidity has been widely reported among bisexual and homosexual individuals. (Frisell et al., 2010). However, the causes of this psychiatric ill-health are mostly unknown. Family rejection may be the factor causes psychiatric distress among MSMs. Rates of depression, generalized anxiety disorder (GAD), eating disorders; alcohol dependence and attention-deficit hyperactivity disorder (ADHD) were increased among homosexuals. Components of minority stress influence the risk of psychiatric ill-health among individuals with any same-sex sexual partner. However, substantial confounding by familial factors suggests a common genetic and/or environmental liability for same-sex sexual behaviour and psychiatric morbidity. Lilith Roggemans, Bram Spruyt, Filip Van Droogenbroeck, Gil Keppens 2005, conducted a study on “Religion and negative attitudes towards homosexuals”. An analysis of urban young people and their attitudes towards homosexuality” shown that religious persons report more prejudice against homosexuality when compared to their non-religious counterparts. This offers us a more detailed view on the exact nature of the relationship between religiosity and the latter attitudes among youth than what has been achieved so far. For both Christian and Muslim believers, we found more negative attitudes towards homosexuality, even after controlling for authoritarianism and a more traditional view on gender roles. Although boys appeared, in general, more negative towards homosexuality than girls, the gender gap amongst young Muslims was twice as large when compared to non-Muslims.

Yasemin Besen, Gilbert Zicklin 2007, conducted a study “Young men, religion and attitudes towards homosexuality”. It explains attitudes towards gays and lesbians, and explores the complex relationship of religiosity, youth, masculinity and support for gay rights. Based on a large, reliable and nationally representative study (n=1405) from PEW Center carried out in 2006, they estimate three logistic regression models predicting approval for gay marriage, gay adoption and gays in the military, which helps us to observe the differences. They conclude that while religiosity and fundamentalism negatively affect support for all three issues, the relationship varies by age and gender. Generally, young men do not show differences in their views of gay marriage, but men, especially religious, young men do show more negative attitudes than their female counterparts in support for gay adoption. Finally, men show more positive attitudes towards gays in the military.

### **CHAPTER III**

### **METHODOLOGY**

**Aim**

Methodology doesn't set out to provide solutions it is therefore not the same as a method. Instead, a methodology offers the theoretical underpinning for understanding which method, set of method, or best practices can be applied to a case, for example to calculate a specific result.

To study the religiosity and attitude towards homosexuality among Indian adults.

**Statement of the problem**

A study of religiosity and attitude towards homosexuality among Indian adults.

**Objective**

- To find the relationship between religiosity and attitude towards homosexuality
- To find the difference between religiosity and attitude towards homosexuality
- To find the difference between adult male and female, religiosity
- To find the difference between adult male and female, attitude toward homosexuality

**Hypotheses**

Ho1 There is no significant relation in Religiosity and attitude towards homosexuality among Indian men.

Ho2 There is no significant relation between Religiosity and attitude towards homosexuality among Indian women.

Ho3 There is no significant difference in Religiosity among Indian men and Indian women.

Ho4 There is no significant difference in the level of attitude towards homosexuality among Indian men and Indian women

### **Research design**

Research design is defined as a framework of methods and techniques chosen by a researcher to combine various components of research in a reasonably logical manner so that the research problem is efficiently handled. It provides insights about “how” to conduct research using a particular methodology. Researcher adopted descriptive research design for the current study. It is a scientific method which involves observing and describing the behavior of a subject without influencing it in any way (A K Singh 1997)

A correlational research design investigates relationships between variables without the researcher controlling or manipulating any of them. A correlation reflects the strength and/or direction of the relationship between two (or more) variables. The direction of a correlation can be either positive or negative.

### **Operational definition**

Religiosity is defined as belief in God accompanied by a commitment to follow principles believed to be set forth by God. † (McDaniel & Burnett, 1990)

Homosexuality is a preference for affiliation and sexual activity with a person of the same sex. S Reber (1995):

## **Sample**

A sample is a group of people, objects or items that are taken from a larger population or measurement. The sample should be representative off the population to ensure that we can generalize the finding from the research sample to the population as a whole. The sample of present study consist of 224 Indian adults, of which 112 Indian men and 112 Indian women.

## **Population**

A total of 224 adults (112 males and 112 females) between the age of 18 to 35 from various Thrissur and Ernakulam District, Kerala participated.

## **Sample design**

For the present study, random sampling technique was used. Random sampling or probability sampling is a sampling method that allows for the randomization of sample selection that is each sample has the same probability as other samples to ne selected to serves as a representation of an entire population.

## **Inclusion criteria**

- Participants should be in an age range of 18and 35 those who can read and understand English language were only included in this study.
- Having no identified physical or mental disorder.

## **Exclusion criteria**

- Men aged below 18 and above 35
- Women aged below 18 and above 35

- Participants from other countries than India
- Adults having identified physical or mental disorder.

### **Tools / questionnaire**

#### **The Centrality of Religiosity Scale (CRS)**

it developed by Stefan Huber and Odilo W. Huber 2012. It has 15 item to measure the individual's level of religiosity. It's Construct Validity score was 0.83 and reliability range of CRS was ( $\alpha=0.73$  to 0.83)

#### **Scoring**

CRS was designed to measure five basic dimensions of religiosity such as Intellect, Ideology, Public practice, Private practice and Experience. The intellectual dimensions contain 3 items (1, 6, 11), ideology comprise of 3 items (2, 7, 12), dimensions of public practice practices contain 3 items (3, 8, 13), private practice contain 3 items (4, 9, 14), religious experience having 3 items (5, 10, 15), and when all dimension summed up together it indicates about whole religiosity level of individual.

#### ***Homosexuality Attitude Scale (HAS)***

it developed by Kite & Deaux in 1986. Total number of items was 21 And its scale correlates. 50 and test-retest reliability ( $r = .71$ ) and convergent validity, the scale correlates ( $r_s = .50$ ) with FEM scale (Spence & Ferree & Miller, 1978) and Attitude towards women scale (Spence & Helmreich, 1978)

#### **Scoring**

It is a 5-point scale ranging from 1 (Strongly Agree) to 5 (Strongly Disagree). Items 1,2, 6, 8, 13, 14, 15, 18, 19, 20, and 21 are reverse scored.

## **Procedure**

Consent form was provided for explain the purpose, nature and confidentiality of research to volunteer their participation freely, without any threat. A Personal data sheet was used to obtain basic information of the participants such as demographic status like age, education, socioeconomic status etc. Since covid-19 was contagious at the time, it was difficult for the researcher to collect data directly from the participants so all data was collected using survey administration app called Google forms and was send via Email and WhatsApp. The participants were asked to fill-up the forms as soon as possible. Two questionnaires were included in the form. Then, the responses were collected. The data was checked for errors and eliminated those responses filled by female gender, to aid in the study. The data was then assigned and analysed using the SPSS software. And the results were interpreted to analyse whether the hypotheses formulated for the study are proven true or not.

## **Data analysis technique**

- SPSS 20 was used to analyse the scored data. To find the correlation and differences among adults on Religiosity and Attitude towards homosexuality. And Pearson's correlation and t-test was used. The t test is to use test the null hypothesis in the study. Also, we conduct normality test to find the normal distribution of data.
- Pearson Correlation Coefficient was conducted to find whether there is any relation between religiosity and homosexuality.

**CHAPTER IV**  
**RESULTS AND DISCUSSION**

Analysis and interpretation of data is considered one of the crucial points of any research process. Analysis and interpretation are the process of making sense of numerical data that has been gathered, analysed and presented. After collecting required data, the data has no meanings of its own, if it is not analysed and interpreted properly. It can be fair to say that research generally consists of two steps, the collection of data and the interpretation of data. Interpretation describes as a critical examination of the results of the analysis in the view of all the limitations of that gathered data.

Data analysis is the act of converting the data with the aim of extracting useful information and valid conclusion. Analysis is the process of systematically applying statistical tools and logical techniques to describe, illustrate, condense, summarize and evaluate data and drawing inductive inferences.

C.R Kothari (1990) explains that the term analysis refers to the computation of certain measures along with searching for patterns of relationship that exists among data – groups.

This chapter deals with the analysis and discussion of the data obtained through the data collection. A total of four hypotheses were framed and tested the collected data by using different statistical tests. The statistical analyses used are descriptive statistics, correlation and Student's t-test.

### **Preliminary analysis**

Preliminary analysis entails the fundamental descriptive statistics like mean, median, mode, standard deviation, skewness and kurtosis of the collected data.

Preliminary analysis helps the investigator to identify the statistical test has to be done .it determines the normality of the data. On the basis of preliminary analysis, selection of parametric and non-parametric tests is carried out.

### **Descriptive Statistics**

**Table 1**

*Table shows details about mean median mode, SD deviation, skewness and kurtosis of each variable*

<i>Variables</i>	<i>Mean</i>	<i>Median</i>	<i>Mode</i>	<i>St. Deviation</i>	<i>Skewness</i>	<i>Kurtosis</i>
<i>Religiosity</i>	45.444	45.000	42.000	14.178	-0.111	-0.587
<i>Attitude towards homosexuality</i>	59.307	60.000	60.000	10.420	-0.190	1.065

Table 1 shows the descriptive statistics of scores of the variables. The mean and standard deviation scores obtained for the variables of religiosity and attitude towards homosexuality are 45.444, 14.178 ,59.307 and 10.420 respectively. Here the skewness and kurtosis values of religiosity and attitude towards homosexuality are -0.111, -0.190 and -0.587, 1.065 respectively.

From the table of preliminary analysis, it can be said that the data obtained from the sample is normally distributed it means that the variables under study are not much

deviated from normality. Hence the data collected is viable for parametric statistical analysis.

**Table 2**

***The correlation coefficient between Religiosity and Attitude towards homosexuality among Indian men***

<i>Variables</i>		<i>Religiosity</i>	<i>Attitude towards homosexuality</i>
<i>Religiosity</i>	<i>N</i>	-	
	<i>Pearson's r</i>	-	
	<i>p-value</i>	-	
<i>Attitude towards homosexuality</i>	<i>N</i>	112	-
	<i>Pearson's r</i>	0.017	-
	<i>p-value</i>	0.860	-

***No significant relationship***

Table indicates the correlation between variables religiosity and attitude towards homosexuality among Indian adult men. From the table, it can be seen that there is no correlation coefficient  $r$  for religiosity and attitude towards homosexuality is 0.017. This indicates that there is no significant correlation between two variables. which means increase the level of religiosity in Indian men will not leads to any attitude changes towards homosexual people. Hence this hypothesis is accepted.

In cross cultural analyses, countries with high percentages of men display less opposition to homosexuality and same-se marriage (McVeigh and Diaz 2009)

**Table 3**

***The correlation coefficient between Religiosity and Attitude towards homosexuality among Indian women***

<i>Variables</i>		<i>Religiosity</i>	<i>Attitude towards homosexuality</i>
<i>Religiosity</i>	<i>N</i>	-	
	<i>Pearson's r</i>	-	
	<i>p-value</i>	-	
<i>Attitude towards homosexuality</i>	<i>N</i>	112	-
	<i>Pearson's r</i>	-0.040	-
	<i>p-value</i>	0.674	-

***No significant relationship***

Table indicates the correlation between variables religiosity and attitude towards homosexuality among Indian women. From the table it can be seen that there is no correlation coefficient  $r$  for religiosity and attitude towards homosexuality is - 0.040. this indicates that there is no significant relationship between religiosity and attitude towards homosexuality at the level of 0.674 which means, when one variable increases the other will not increase. It implies that religiosity does not accelerates negative attitude towards homosexuals. Hence there is not significant relationship between the two variables and they are not correlated. Thus, among adult women's,

religiosity is not related with attitude towards homosexuality. Hence the hypothesis is accepted.

Davinia hersas and Delfen orfega sanchez (2020) study on evaluation of sexist and prejudiced attitude towards homosexuality in Spanish women teachers .and the results showed, they have low level of prejudices and negative attitude towards homosexuals. This study supports the above findings. Thus, from the confirmation of the results from the above table the hypothesis number 2, there is no significant relationship between religiosity and attitude towards homosexuality among Indian women is accepted

**Table 4**

***Mean, standard deviation and t-value obtained by Indian men and Indian women in Religiosity.***

<i>Variables</i>	<i>Indian men</i>		<i>Indian women</i>		<i>t-value</i>	<i>Sig</i>
	<i>(N=112)</i>		<i>(N=112)</i>			
	<i>Mean</i>	<i>S. D</i>	<i>Mean</i>	<i>S. D</i>		
<i>Religiosity</i>	48.48		48.39	14.956	3.176	0.002
	13.901					

***\*\*significant difference at 0.01 level***

Table 4 show the mean, standard deviation and t value with respect to religiosity among Indian men and women. The obtained t value is (3.176) which indicates there is a significant difference between Indian men and women on religiosity, which is

significant at 0.01 level. It also reveals that the mean score for religiosity of men (48.48) is greater than that of Indian women (48.39). hence the hypothesis is rejected. Men more so than women, it helps in creating an ethical framework and also a regulator for values in day-to-day life. Being religious men helps to acts as an agency of socialization.

Landon Schnabel, David McLendon and Conrad Hackett (2007) study on men appear more religious than women.it found that men are more religious than women, mostly men are going to church for prayer and attend religious services than women. Which would suggest Jewish men seen more religious for the same reasons Muslim men attend frequently. Women have some boundaries to attend and visit church or devotional place it may be a reason for men are more religious than women.

**Table 5**

***Mean, standard deviation and t-value obtained by Indian men and Indian women in attitude towards homosexuality***

<b><i>Variables</i></b>	<b><i>Indian men</i></b> <b><i>(N=112)</i></b>		<b><i>Indian women</i></b> <b><i>(N=112)</i></b>		<b><i>t-</i></b> <b><i>value</i></b>	<b><i>Sig</i></b>
	<b><i>Mean</i></b>	<b><i>S. D</i></b>	<b><i>Mean</i></b>	<b><i>S. D</i></b>		
<b><i>Attitude</i></b>						
<b><i>towards</i></b>	57.52	12.200	61.06	7.988	2.571	0.01
<b><i>homosexuality</i></b>						

***\*\*Significant difference at 0.01 level***

Table 5 show the mean, standard deviation and t value with respect to attitude towards homosexuality among Indian men and women. The obtained t value is (2.571) which indicate that there is a significant difference between Indian men and women on attitude towards homosexuality. Which is significant at 0.01 level. It also reveals that the mean score for attitude towards homosexuality of men (mean= 57.52) is less than that of the Indian women of attitude towards homosexuality (mean=61.06) hence the hypothesis is rejected.

Individual difference in attitude towards homosexuality have been linked to numerous personality and demographic variables. Thus, Indian adult women have high stereotype thoughts than men, it leads to hostility towards homosexuals. Also, they have lot of misconceptions about homosexual population. So that, it implies women has unfavourable evaluation of them and anxieties about homosexuals. Thus, from the confirmation of the results from the above table, the hypothesis number 4, there is a significant difference between Indian men and women on attitude towards homosexuality and rejected.

Vivien k.g Lim (2002) study on gender difference and attitude toward homosexuality. It pointed out 87% women reported that they would be disappointed if they realized that their child was homosexual. 71% women was not comfortable to work with homosexuals. 37% women were uncertain whether they would feel uncomfortable if neighbour was homosexuals. Results shows that women have high level of negative attitude towards homosexuals than men.

To summarize it may be said there exist significant difference between Indian men and women on variables religiosity and attitude toward homosexuality. where the

mean score of men religiosity is higher than women and the mean score of women on attitude towards homosexuality is higher than men. There is no significant correlation between religiosity and attitude towards homosexuality among Indian men and same in the case with women on religiosity and attitude toward homosexuality has no significant correlation.

**CHAPTER V**

**CONCLUSION**

The present study “religiosity and attitude towards homosexuality among Indian adults” investigate the vivid influence of such variables among types of genders. The total number of hypotheses framed was four, which were subjected to further analysis and tested by various statistical methods. 224 participants served for this study, with equal number of adult men and women. It carried the centrality of religiosity scale (CRS) and homosexuality attitude scale (HAS) for data collection. After collecting responses, the data was analysed using statistical method such as persons correlation and t-test. It was found that there is no significant correlation between religiosity and attitude towards homosexuality among Indian men and women. But there is significant difference in religiosity and attitude towards homosexuality among men and women. Men are more religious than women and women has greater negative attitude and misconception about homosexuals.

### **Findings of study**

- The conducted study proves that there is no significant relationship between religiosity and attitude towards homosexuality among Indian adults.
- An increase or decrease in religiosity is not related to increase or decrease in attitude towards homosexuality on men and women.
- There is a significant difference in religiosity among Indian men and women
- Men tends to more religious nature in society than women
- There is a significant difference in attitude towards homosexuality among men and women
- Women has misconception and anxieties about homosexuals, that leads to more negative attitude toward homosexuals.

**Tenability of the hypothesis****Hypothesis 1:**

There is no significant relationship between religiosity and attitude towards homosexuality in Indian men.

Results revealed that there is no significant relationship between religiosity and attitude towards homosexuality in Indian men. Here hypothesis is accepted.

**Hypothesis 2:**

There is no significant relationship between religiosity and attitude towards homosexuality in Indian women.

Results revealed that there is no significant relationship between religiosity and attitude towards homosexuality in Indian women. Here hypothesis is accepted.

**Hypothesis 3:**

There is no significant difference in religiosity among Indian men and Indian women.

Results revealed that there is a significant difference in religiosity among Indian men and Indian women. Men tends to be more religious nature than women. Here hypothesis is rejected.

**Hypothesis 4:**

There is no significant difference in attitude towards homosexuality among Indian men and Indian women.

Results revealed that there is a significant difference in level of attitude among Indian men and Indian women. Women has negative attitude and misconception about homosexuals. Here also hypothesis is rejected.

### **Implication of study**

- The findings in the study can be utilized in formulation of better counselling and other strategies for people who are going through anxiety about homosexual people
- Findings of the study can be helpful to do further studies on the same topic by adding more variables such as mass media, peer support and environmental support etc.
- Finding will help in providing better knowledge and education in women as well as men from early age itself.
- The study can serve as a reference for students or researchers those who are focusing on similar kind of topics.

### **Limitation of the study**

- Only limited samples were collected in this study
- Different age levels for the subjects could have been investigated to be sure whether trends of the results would be different with age.
- Lack of sufficient time and resources was major limitation
- Face to face interaction with participants was not possible

### **Scope For Further Studies**

- The study can be extended to larger sample.
- The study can be done in both qualitative methods to assess more information.

- It can be taken on a larger scale to include people with different age groups.
- The study can be helpful to do further studies on the same topic by adding more variables such as mass media, gender role, peer pressure etc.
- This study can also be done by focusing particular religious community like Hindus, Islam, Judaism etc.
- Members from different socio-economic backgrounds can be studied to get better information.
- The study can be served as reference for those studies focus with related topics.
- The study can be extended to include other psychological variables related to present study.

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**APPENDICES**

**The centrality of religiosity scale**

01: How often do you think about religious issues?

5	4	3	2	1
Very often	Often	Occasionally	Rarely	Never

02: To what extent do you believe that Gods, deities, or something divine exists?

5	4	3	2	1
Very much so	Quite a bit	Moderately	Not very much	Not at all

03: How often do you take part in religious services?

- A) Several times a day
- B) Once a day
- C) More than once a week
- D) Once a week
- E) One to three times a month
- F) A few times a year
- G) Less than a few times a year
- H) Never

Between 04a and 04b, answer the question that pertains more to your life (answer one).

04a: How often do you pray?

- A) Several times a day
- B) Once a day
- C) More than once a week
- D) Once a week
- E) One to three times a month
- F) A few times a year
- G) Less than a few times a year
- H) Never

04b: How often do you meditate?

- A) Several times a day
- B) Once a day
- C) More than once a week
- D) Once a week
- E) One to three times a month
- F) A few times a year
- G) Less than a few times a year
- H) Never

Between 05a and 05b, answer the question that pertains more to your life (answer one).

05a: How often do you experience situations in which you have the feeling that God or something divine intervenes in your life?

5	4	3	2	1
Very often	Often	Occasionally	Rarely	Never

05b: How often do you experience situations in which you have the feeling that you are in one with all?

5	4	3	2	1
Very often	Often	Occasionally	Rarely	Never

06: How interested are you in learning more about religious topics?

5	4	3	2	1
Very much so	Quite a bit	Moderately	Not very much	Not at all

07: To what extent do you believe in an afterlife—e.g. immortality of the soul, resurrection of the dead or reincarnation?

5	4	3	2	1
Very much so	Quite a bit	Moderately	Not very much	Not at all

08: How important is to take part in religious services?

5	4	3	2	1
Very much so	Quite a bit	Moderately	Not very much	Not at all

Between 09a and 09b, answer the question that pertains more to your life (answer one).

09a: How important is personal prayer for you?

5	4	3	2	1
Very much so	Quite a bit	Moderately	Not very much	Not at all

09b: How important is meditation for you?

5	4	3	2	1
Very much so	Quite a bit	Moderately	Not very much	Not at all

Between 10a and 10b, answer the question that pertains more to your life (answer one).

10a: How often do you experience situations in which you have the feeling that God, deities, or something divine wants to communicate or to reveal something to you?

5	4	3	2	1
Very often	Often	Occasionally	Rarely	Never

10b: How often do you experience situations in which you have the feeling that you are touched by a divine power?

5	4	3	2	1
Very often	Often	Occasionally	Rarely	Never

11: How often do you keep yourself informed about religious questions through radio, television, internet, newspapers, or books?

5	4	3	2	1
Very often	Often	Occasionally	Rarely	Never

12: In your opinion, how probable is it that a higher power really exists?

5	4	3	2	1
Very much so	Quite a bit	Moderately	Not very much	Not at all

13: How important is it for you to be connected to a religious community?

5	4	3	2	1
Very much so	Quite a bit	Moderately	Not very much	Not at all

Between 14a and 14b, answer the question that pertains more to your life (answer one).

14a: How often do you pray spontaneously when inspired by daily situations?

- A) Several times a day
- B) Once a day
- C) More than once a week
- D) Once a week
- E) One to three times a month
- F) A few times a year
- G) Less than a few times a year
- H) Never

14b: How often do you try to connect to the divine spontaneously when inspired by daily situations?

- A) Several times a day
- B) Once a day
- C) More than once a week
- D) Once a week
- E) One to three times a month
- F) A few times a year
- G) Less than a few times a year
- H) Never

15: How often do you experience situations in which you have the feeling that God, deities, or something divine is present?

5	4	3	2	1
Very often	Often	Occasionally	Rarely	Never

### Homosexuality Attitude Scale

Source: Kite, M.E., & Deaux, K. (1986). Attitudes toward homosexuality: Assessment and behavioral consequences. *Basic and Applied Social Psychology*, 7, 137-162.

Please indicate your level of agreement with the items below using the following scale:

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

1. I would not mind having a homosexual friend.
2. Finding out that an artist was gay would have no effect on my appreciation of his/her work.
3. I won't associate with known homosexuals if I can help it.
4. I would look for a new place to live if I found out my roommate was gay.
5. Homosexuality is a mental illness.
6. I would not be afraid for my child to have a homosexual teacher.
7. Gays dislike members of the opposite sex.
8. I do not really find the thought of homosexual acts disgusting.
9. Homosexuals are more likely to commit deviant sexual acts, such as child molestation, rape, and voyeurism (Peeping Toms), than are heterosexuals.
10. Homosexuals should be kept separate from the rest of society (i.e., separate housing, restricted employment).

11. Two individual of the same sex holding hands or displaying affection in public is revolting.
12. The love between two males or two females is quite different from the love between two persons of the opposite sex.
13. I see the gay movement as a positive thing.
14. Homosexuality, as far as I'm concerned, is not sinful.
15. I would not mind being employed by a homosexual.
16. Homosexuals should be forced to have psychological treatment.
17. The increasing acceptance of homosexuality in our society is aiding in the deterioration of morals.
18. I would not decline membership in an organization just because it had homosexual members.
19. I would vote for a homosexual in an election for public office.
20. If I knew someone were gay, I would still go ahead and form a friendship with that individual.
21. If I were a parent, I could accept my son or daughter being gay.

---

Note: Items 1,2, 6, 8, 13, 14, 15, 18, 19, 20, and 21 are reverse scored.

Project Report

On

# FUZZY LOGIC AND IT'S APPLICATION

*Submitted*

*in partial fulfilment of the requirements for the degree of*

BACHELOR OF SCIENCE

*in*

MATHEMATICS

*by*

LAKSHMI S N

(Register No. AB19AMAT016)

*Under the Supervision of*

DR. URSALA PAUL



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APRIL 2022

ST. TERESA'S COLLEGE (AUTONOMOUS), ERNAKULAM



CERTIFICATE

This is to certify that the dissertation entitled, **FUZZY LOGIC AND IT'S APPLICATIONS** is a bonafide record of the work done by Ms **LAKSHMI S N** under my guidance as partial fulfillment of the award of the degree of **Bachelor of Science in Mathematics** at St. Teresa's College (Autonomous), Ernakulam affiliated to Mahatma Gandhi University, Kottayam. No part of this work has been submitted for any other degree elsewhere.

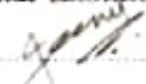
Date: 04/03/2022  
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External Examiners

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2. ....

## DECLARATION

I hereby declare that the work presented in this project is based on the original work done by me under the guidance of Dr. Ursala Paul, Assistant Professor, Department of Mathematics, St. Teresa's College(Autonomous), Ernakulam and has not been included in any other project submitted previously for the award of any degree.

Ernakulam

Date: 04/03/2022



**LAKSHMI S N**

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# Chapter 1

## INTRODUCTION

---

Fuzzy means vagueness or ambiguity. Fuzzy Mathematics is a branch of mathematics which includes ambiguous set theory and ambiguous logic that deals with the partial incorporation of elements into a set as opposed to including a simple binary "yes" or "no" in one spectrum. In this project we focus on ambiguous logic - a multi-valued logic that can incorporate true values into any real number lying in  $[0,1]$ , and its application in a washing machine.

### 1.1 OBJECTIVES OF THE PROJECT

- To understand the importance of Fuzzy Logic.
- To know how it is different from Crisp Logic and hence its wide acceptance and applications.
- To understand the whole working process of a Fuzzy Logic Controller.
- To study its application in Washing Machine.

### 1.2 METHODOLOGY AND APPROACH

After getting to know about the basic definitions and functioning of fuzzy logic controllers, we have made use of the Mamdani approach of aggregating the rules, by disjunctive method. We have also plotted the membership functions and derived corresponding degree of memberships, which are used for calculations.

# Chapter 2

## EMERGENCE OF FUZZY LOGIC

---

The process of using computer technology to complete a given goal-oriented task is called Computing. Briefly it is the process of giving an input to get back an output using certain control actions.

Computing can be classified as:

1. Hard computing
2. Soft computing

### 2.1 HARD COMPUTING

Hard computing is a traditional computing method. It is the best for solving the mathematical problems. It relies basically on binary logic and crisp system. The input data for hard computing should be exact and clear. The output will be precise and unambiguous. Hard computing uses two-valued logic. It makes use of proper mathematical models or algorithms to perform computing, thus giving precise (not approximate) results. Its control action must be unambiguous and formally defined and there must exist any given mathematical models.

### 2.2 SOFT COMPUTING

Soft computing is a set of algorithms. It includes neural network, fuzzy logic and evolutionary computing. It is an approach where we compute solutions to the existing complex problems, where output results are imprecise or fuzzy in

nature. It does not require any mathematical modelling to find the solution for a given problem. It makes use of algorithms which are not precise, uncertain, partially true and approximate. It is used in solving real-world problems as it has a random probability distribution or pattern that may be analysed statistically but may not be predicted precisely. Soft computing relies basically on formal logic. Soft computing use multivalued logic and is adaptive in nature.

Soft computing has three main branches:

- i) Artificial neural network
- ii) Fuzzy logic
- iii) Evolutionary computation

### 2.2.1 ARTIFICIAL NEURAL NETWORK

An artificial neural network is similar to the network of neurons in human brain. Using this the computer will be able to learn things and make decisions like a human. Regular computers are programmed such that they behave like interconnected brain cells. It communicates using electrical signals. Some of its uses are classification of information, clustering data and prediction of outcomes.

Eg:- If we take a handwritten character – say alphabet ‘A’ – it can have different forms when it is written in English by many people.

As shown below, whichever way they write we can understand the character, because one already knows how the character looks like. This concept can be compared to our neural network system.

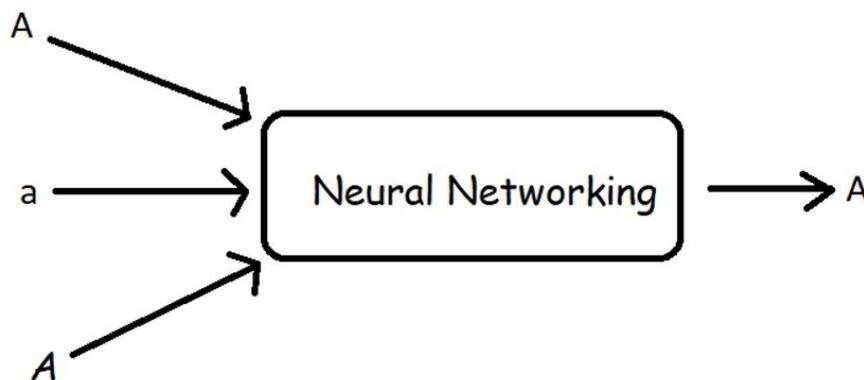


Figure 2.1: Example of Neural Networking

How is neural network related to mathematics? The main elements of neural network are neurons and synapses, both in charge of computing mathematical operations. Neural networks are nothing but a series of mathematical computations. Each synapse holds a weight, while each neuron computes a weighted sum using input data and synapses weights.

### 2.2.2 FUZZY LOGIC

Fuzzy logic is a multivalued logic system in which the truth value of variables will be any real number in  $[0,1]$ . It is the computing approach based on degrees of truth rather than the usual true or false method (1 or 0). Fuzzy logic has intermediate values that present partial truth or false. It can have the truth values like partially true/false, rather than completely true/false values. It considers all available information, which can be certain or uncertain information and make the best possible output from it.

### 2.2.3 EVOLUTIONARY COMPUTATION

Computational systems that study ideas from natural evolution is called Evolutionary computation. It's actually a bunch of troubleshooting techniques with principles based on genetic inheritance and natural selection. Evolutionary computation is usually implemented on computer systems that are used to solve problems, implementing techniques such as evolutionary algorithms, differential evolution, genetic algorithms and harmony search.

The mathematics behind the working of evolutionary computing is its sequence representation as every chromosome is a sequence of genes.

Eg:- A person plans to invest some money in the bank. There is availability of different banks with different schemes and policies. The individual decides the amount to be invested in the bank, to get maximum profit and there are certain criteria for that which can be overcome by the "Evolutional Computing" algorithm like genetic computing.

## 2.3 ORIGIN OF FUZZY LOGIC

There have been a lot of discussions about the uncertainty of events and occurrences, the imprecision of outcomes and they are also much into philosophical

debates. Boolean logic was insufficient to cope with this ambiguity. Hence there was a necessity of something which was beyond the two-valued logic. The search and discovery began in the early beginning of 20th century. Emil Leon Post, in 1921, had introduced more than 2 truth logical degrees. Later, Jan Lukasiewicz Clarence Irving Lewis presented the 3 valued logic. In 1930, Lukasiewicz and Alfred Tarski had introduced the 0-valued version, sometimes called the Lukasiewicz-Tarski logic. Later in 1945, Grigore Constantin Moisil reformulated it in an axiomatic algebraic form, and extended to n-valued logic.

The term fuzzy logic was coined in 1965. The suggestion of the ambiguous set theory was by the great mathematician and computer scientist Lotfi Zadeh. However, vague logic has been studied since the 1920s as a logic of infinite value - especially Lukashevich and Tarski. The vague logic is based on people's observation make decisions based on inaccuracies and numericities in formation. These models have the ability to identify, represent, manage, interpret use and obscure data and information.

# Chapter 3

## FUZZY LOGIC

---

### 3.1 CRISP LOGIC v/s FUZZY LOGIC

The study of principles and methods of reasoning is called *Logic*. Propositions are statements that must either be true or false. And the logic behind such propositions is called classical logic/crisp logic. It is the same as Boolean logic, which gives the output either 0 or 1. The statement is either true (1) or false (0). We have a part of this logic, called propositional logic, where there are combinations of variables – called logic variables instead of arbitrary propositions and these variables assume true/false value only when it takes particular proposition. Every proposition has a negation. So, the negation of truth value "true" is false (and vice-versa).

But at times, the two-valued logic need not be sufficient to give a satisfactory truth value to a given statement. Hence an *Intermediate* value was introduced to the two-valued logic.

Eg:- We can take true = 1, false = 0 and the intermediate value =  $\frac{1}{4}$ . And the negation values can be taken as:  $\text{neg}(0) = 1$ ,  $\text{neg}(1) = 0$  and  $\text{neg}(\frac{1}{4}) = \frac{3}{4}$ .

Later on, n-valued logic was derived, which had n truth values, where  $n \geq 2$  and lie on  $[0,1]$ . Such a logic is called *Fuzzy Logic*. It is a continuous valued logic with a membership function.

## 3.2 FUZZY PROPOSITION

A statement 's' which acquires a fuzzy truth value  $T(s)$  is called a *Fuzzy proposition*. The truth value of fuzzy proposition depends on its degree of truth and its value lies in  $[0,1]$ .

Eg:- Let 's' be a statement: The weather is fine.

Then the values of  $T(s)$  can be

$T(s) = 1$ , if s is absolutely true.

$T(s) = 0.7$ , if s is partially true.

$T(s) = 0$ , if s is totally false.

This range of the truth values is actually the main difference between classical propositions and fuzzy propositions. Because, the classical propositions can either be true or false, but for fuzzy propositions, the true or false value is a matter of degree. In other words, the truth and falsity of classical propositions are expressed by - 1 and 0, respectively, whereas in fuzzy propositions, the degree of truth is expressed by a number in the unit interval  $[0, 1]$ . Fuzzy propositions are mainly of four types:

1. Unconditional and unqualified propositions
2. Unconditional and qualified propositions
3. Conditional and unqualified propositions
4. Conditional and qualified propositions

### 3.2.1 UNCONDITIONAL AND UNQUALIFIED PROPOSITIONS

The canonical form of this type of fuzzy proposition is -

$$p: T \text{ is } F$$

Where, T is a variable which takes value t from a universal set U. F is a fuzzy set on U that represents a given inaccurate predicate such as fast, low, tall etc.

Eg:- Let 's' be a statement: The tree is tall.

Then the values of  $T(s)$  can be -

$T(s)=1$ , if s is absolutely true

$T(s)=0.6$ , if s is partly true

$T(s)=0$ , if s is totally false

where,  $T(s) = \mu F(s)$  - the membership grade function that indicates the degree of truth of  $v$  belongs to  $F$ . Its value ranges from 0 to 1.

### 3.2.2 UNCONDITIONAL AND QUALIFIED PROPOSITIONS

The canonical form of this type of fuzzy proposition is -

$$p: V \text{ is } F \text{ is } S$$

where,  $V$  and  $F$  have the same meaning and  $S$  is a fuzzy truth qualifier.

Eg:- We can have a statement  $p$ : The tree is tall is very true.

### 3.2.3 CONDITIONAL AND UNQUALIFIED PROPOSITIONS

The canonical form of this type of fuzzy proposition is -

$$p: \text{if } X \text{ is } A, \text{ then } Y \text{ is } B$$

where,  $X, Y$  are variables in universes  $U_1$  and  $U_2$  and  $A, B$  are fuzzy sets on  $X, Y$ .

Eg:-  $p$ : If the tree is tall then risk is low.

### 3.2.4 CONDITIONAL AND QUALIFIED PROPOSITIONS

The canonical form of this type of fuzzy proposition is -

$$p: (\text{if } X \text{ is } A, \text{ then } Y \text{ is } B) \text{ is } S$$

where, all variables have same meaning as previously declared.

Eg:-  $p$ : If the tree is tall than risk is low is true.

## 3.3 FUZZY QUANTIFIERS

The scope of fuzzy propositions can be extended using fuzzy quantifiers. *Fuzzy Quantifiers* can be defined as the fuzzy numbers which take part in fuzzy propositions and they make use of characteristic linguistic terms.

There are two different types of fuzzy quantifiers: -

1. Fuzzy quantifiers of first kind
2. Fuzzy quantifiers of second kind

### 3.3.1 FUZZY QUANTIFIERS OF FIRST KIND

These are defined on the set of real numbers. The characteristic linguistic terms they make use are - “about 20”, “much more than 80”, “at least about 6”, etc. These are also known as Absolute Fuzzy Quantifiers.

There are 2 types of propositions which involve the fuzzy quantifiers of first kind:

- i. The first type of propositions will be of the form –

p: There are Q i's in I such that  $V(i)$  is F.

Here Q - is a first kind quantifier, i - is an individual from a given set I,  $V(i)$  - is a variable associated to the individual I which takes values from a universe - E, and F - is a fuzzy set defined over the universe E.

Eg: - Let us take a statement -

p: There are about 7 athletes in the ground, whose running speed is very high.

In the given proposition,

- Q - fuzzy number capturing the linguistic term - about 7.
- i - the athletes
- $V(i)$  - running speed of athlete i.
- F - Fuzzy set that represents a high speed in running.

- ii. The second type of propositions will be of the form –

p: There are Q i's in I such that  $V_1(i)$  is  $F_1$  and  $V_2(i)$  is  $F_2$ .

Here  $V_1, V_2$  - are variables that take values from sets  $E_1, E_2$  respectively, I - is an index set by which distinct measurements of variables  $V_1, V_2$  are identified, Q - is a fuzzy number on real numbers, and  $F_1, F_2$  - are fuzzy sets on  $E_1, E_2$  respectively.

Eg:- Let us take a statement

p: There are about 7 athletes in the ground, whose running speed is very high and whose fitness is perfect.

In the given proposition,

- Q - fuzzy number capturing the linguistic term - about 7.
- i - the athletes

- I: the index set which labels the athletes in the - ground
- $V_1(i)$  - running speed of athlete i.
- $V_2(i)$  - fitness of athlete i.
- $F_1$  - Fuzzy set that represents a high speed in running.
- $F_2$  - Fuzzy set that represents perfect fitness of athlete.

### 3.3.2 FUZZY QUANTIFIERS OF SECOND KIND

These are defined on the interval  $[0, 1]$ . The characteristic linguistic terms they make use are - “almost all”, “about half”, “most”, etc.

These are also known as Relative Fuzzy Quantifiers.

## 3.4 FUZZY RULES OF INFERENCE

We make use of *fuzzy rules* in fuzzy logic systems to infer an output based on the input variables. It is a conditional statement of the form:

If P then Q

Where  $P = x$  is A, which is the antecedent part and  $Q = y$  is B, which is the consequent part. Here A and B are the linguistic values which may be defined on the fuzzy sets of X and Y respectively - which are universe of discourse.

Eg:- If you study well, then you will pass the exam.

The most important rules of inference are

- i. Modus ponens
- ii. Modus tollens

### 3.4.1 MODUS PONENS

A modus ponens rule is in the form:

Premise:  $x$  is  $A^*$ .

Implication: IF  $x$  is A THEN  $y$  is B.

Conclusion:  $y$  is  $B^*$ .

### 3.4.2 MODUS TOLLENS

A modus tollens rule is in the form:

Premise: x is B\*.

Implication: IF x is A THEN y is B.

Conclusion: y is A\*.

The fuzzy rules can either be decomposed or aggregated.

### 3.4.3 DECOMPOSITION

The compound fuzzy rules are decomposed to n number of simple canonical rules.

There are 4 methods of decomposition:

- i. Multiple Conjunctive Antecedent
- ii. Multiple Disjunctive Antecedent
- iii. Conditional Statement
- iv. Nested If-Then Rules

#### MULTIPLE CONJUNCTIVE ANTECEDENT

Consider the fuzzy rule of the form:

If x is  $A_1, A_2, A_3, \dots, A_n$ , then y is B.

When we have such a compound rule, we apply the method of *Multiple Conjunctive Antecedent* and take the conjunction of each antecedent.

i.e.

$$A_m = A_1 \cap A_2 \cap A_3 \cap \dots \cap A_n \quad (3.1)$$

We know that conjunction  $\rightarrow$  taking the minimum of membership value.

$$\mu_{A_m}(x) = \min [\mu_{A_1}(x), \mu_{A_2}(x), \mu_{A_3}(x) \dots \mu_{A_n}(x)]$$

Then we substitute the corresponding antecedent value, get the consequent and hence decompose the fuzzy rule as:

If x is  $A_m$  then y is  $B_m$ .

#### MULTIPLE DISJUNCTIVE ANTECEDENT

Consider the fuzzy rule of the form: If x is  $A_1, A_2, A_3, \dots, A_n$ , then y is B.

When we have such a compound rule, we apply the method of *Multiple Disjunctive*

*Antecedent* and take the disjunction of each antecedent.

i.e.

$$A_m = A_1 \cap A_2 \cap A_3 \cap \dots A_n \quad (3.2)$$

We know that disjunction  $\rightarrow$ taking the maximum of membership value.

$$\mu A_m (x) = \max [\mu A_1 (x), \mu A_2 (x), \mu A_3 (x) \dots \mu A_n (x)]$$

Then we substitute the corresponding antecedent value, get the consequent and hence decompose the fuzzy rule as:

If x is  $A_m$  then y is  $B_m$ .

#### CONDITIONAL STATEMENTS

Consider the statement:

If  $A_1$  then  $B_1$  else  $B_2$ .

This form of fuzzy rule implies that if a given antecedent  $A_1$  is true, then a given consequent  $B_1$  is true or else the consequent  $B_2$  is true. This compound rule is a *Conditional Statement*. The given compound rule can be decomposed to a simple canonical form using an OR operator as:

If  $A_1$  then  $B_1$  OR If not  $A_1$  then  $B_2$ .

#### NESTED IF-THEN RULES

Consider the statement:

If  $A_1$  then (if  $A_2$  then  $B_1$ ).

This form of fuzzy rule implies that if a given antecedent  $A_1$  is true, and then if a given antecedent  $A_2$  is true, then the consequent  $B_2$  is true. This compound rule is a *Nested If-Then Rules*. The given compound rule can be decomposed to a simple canonical form using an AND operator as:

If  $A_1$  AND  $A_2$  then  $B_1$ .

#### 3.4.4 AGGREGATION

Aggregation is in others words the process of combining. When we have complex fuzzy rules, we aggregate or combine and generate the output rule. The given system can be designed in 2 different ways:

- i) Conjunctive System of Rules
- ii) Disjunctive System of Rules

#### CONJUNCTIVE SYSTEM

Here the system is designed in such a way that it gives equal importance to all the rules and hence all of them must be satisfied for the system to work. Consider that we have  $n$  fuzzy rules, and  $y_1, y_2, y_3, \dots, y_n$  are the  $n$  consequences of those rules. Then we take

$$y_m = y_1 \cap y_2 \cap y_3 \dots y_n \quad (3.3)$$

and hence  $y_m$  is the aggregate output. We can also find the membership value for that particular aggregate output by:

$$\mu_{y_m}(y) = \min [\mu_{y_1}(y), \mu_{y_2}(y), \mu_{y_3}(y) \dots \mu_{y_n}(y)]$$

as we know that conjunction  $\rightarrow$  taking the minimum of membership value.

#### DISJUNCTIVE SYSTEM

Here the system is designed in such a way that equal importance is not given to all the rules and hence all of them need not be satisfied for the system to work. Consider that we have  $n$  fuzzy rules, and  $y_1, y_2, y_3, \dots, y_n$  are the  $n$  consequences of those rules. Then we take

$$y_m = y_1 \cup y_2 \cup y_3 \dots y_n \quad (3.4)$$

and hence  $y_m$  is the aggregate output. We can also find the membership value for that particular aggregate output by:

$$\mu_{y_m}(y) = \max [\mu_{y_1}(y), \mu_{y_2}(y), \mu_{y_3}(y) \dots \mu_{y_n}(y)]$$

as we know that disjunction  $\rightarrow$  taking the maximum of membership value.

## Chapter 4

# FUZZY LOGIC CONTROLLER AND ITS APPLICATION

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### 4.1 Fuzzy Logic Controller

*Fuzzy controllers* work by utilizing knowledge drawn from human operators. There are four modules in fuzzy controller: a fuzzy rule base, a fuzzy inference engine, fuzzification and defuzzification modules. The main steps followed by a Fuzzy controller are:

- i. Taking the values of all the variables representing the relevant conditions of the controlled process.
- ii. Fuzzification - that is the conversion of these values to fuzzy values so that they represent the uncertainties.
- iii. Evaluation of control rules in the fuzzy rule base, by the inference engine, using these fuzzified values.
- iv. The result obtained is a fuzzy set, defined on a universe  $f$ .
- v. Defuzzification – that is the conversion of these values to a single crisp value.

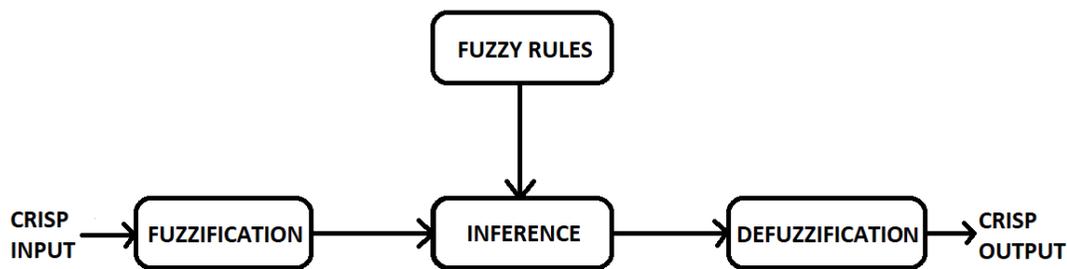


Figure 4.1: Fuzzy Logic Controller

### 4.1.1 Approaches

There are mainly 2 types of inference approaches:

- i. Mamdani Approach
- ii. Takagi Sugeno's Approach

#### MAMDANI APPROACH

It was used in 1975, by Professor Ebrahim Mamdani to control a steam engine and boiler combination. It is one of the most commonly used inference approaches and it's a linguistic fuzzy modelling approach where the values are words/sentence type.

Eg:- very true, partially true, untrue etc.

It is processed in 4 steps:

- i. Fuzzification of input variables.
- ii. Rule evaluation.
- iii. Aggregation of the rule outputs.
- iv. Defuzzification.

#### TAKAGI SUGENO'S APPROACH

It was introduced by Michio Sugeno. Sugeno fuzzy inference is similar to the Mamdani approach. The change in this approach is the change in rule consequent (resultant). It is a precise fuzzy modelling where more numerical terms are used compared to Mamdani approach, and hence giving better results. That is, in the

fuzzy rule, a function of the input variables is being used, instead of the fuzzy set.

Eg:- If  $x$  is  $A$ , AND  $y$  is  $B$ , Then  $z$  is  $f(x, y)$ .

Here  $x$ ,  $y$  and  $z$  - linguistic variables,  $A$  and  $B$  - fuzzy sets on universe of discourse  $X$  and  $Y$ , respectively; and  $f(x, y)$  is a mathematical function.

We have used Mamdani's approach in our application.

## 4.2 APPLICATION

Washing machines are common household appliances in India. The washing machines that efficiently control the wash time is considered vital. Conventional, proportional, integral and differential [PID] controllers have proven to be less capable. Therefore, fuzzy logic enables designers to control complex systems more effectively than traditional approaches. The users of washing machines have been facing the problem of selecting the duration of wash time based on the amount of dirtiness on clothes. In order to overcome these problems, fully-automatic washing machines, which are based on fuzzy logic, offers the advantage of performance, simplicity and less cost.

We have 5 steps in the application:

- i. Identifying Linguistic input and output variables.
- ii. Defining Membership functions for input and output variables.
- iii. Creating a Rule base.
- iv. Rule Evaluation.
- v. Defuzzification.

Here, we have 4 input variables and 5 output variables to get correct wash time. We consider our input as dirt and output as wash-time. So, the input variables will be:

Very Low Dirt (VLD), Low Dirt (LD), High Dirt (HD), Very High Dirt (VHD) and similarly the output variables will be Very Short (VS), Short (S), Medium (M), High (H), Very High (VH).

For Dirt:

$$\mu_{VLD}(x) = \frac{(30 - x)}{30} \quad \text{when } 0 \leq x \leq 30 \quad (4.1)$$

$$\mu_{LD}(x) = \frac{(x)}{30} \quad \text{when } 0 \leq x \leq 30 \quad (4.2)$$

$$\mu_{LD}(x) = \frac{(60 - x)}{30} \quad \text{when } 30 \leq x \leq 60 \quad (4.3)$$

$$\mu_{HD}(x) = \frac{(x - 30)}{30} \quad \text{when } 30 \leq x \leq 60 \quad (4.4)$$

$$\mu_{HD}(x) = \frac{(90 - x)}{30} \quad \text{when } 60 \leq x \leq 90 \quad (4.5)$$

$$\mu_{VHD}(x) = \frac{(x - 60)}{30} \quad \text{when } 60 \leq x \leq 90 \quad (4.6)$$

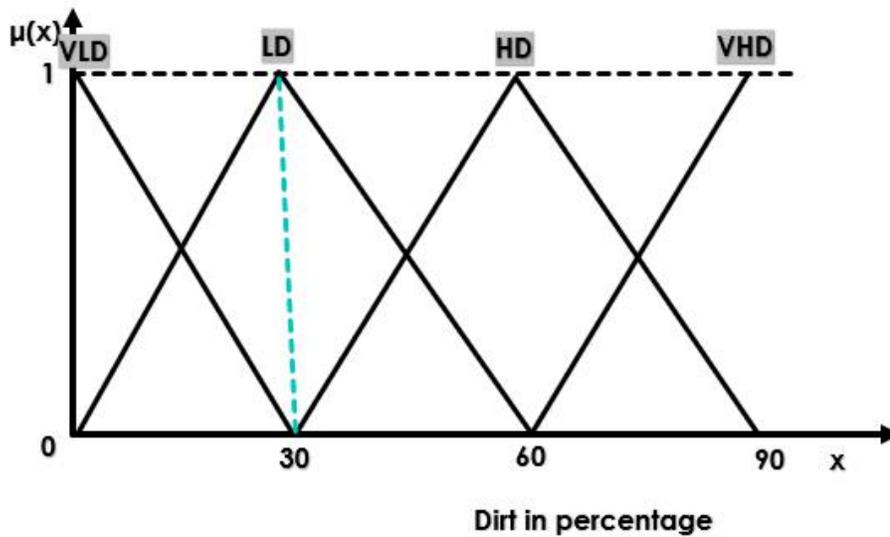


Figure 4.2: Dirt percentage graph

For Wash-time:

$$\mu_{VS}(y) = \frac{(20 - y)}{20} \quad \text{when } 0 \leq y \leq 20 \quad (4.7)$$

$$\mu_S(y) = \frac{(y)}{20} \quad \text{when } 0 \leq y \leq 20 \quad (4.8)$$

$$\mu_S(y) = \frac{(40 - y)}{20} \quad \text{when } 20 \leq y \leq 40 \quad (4.9)$$

$$\mu_M(y) = \frac{(y - 20)}{20} \quad \text{when } 20 \leq y \leq 40 \quad (4.10)$$

$$\mu_M(y) = \frac{(60 - y)}{20} \quad \text{when } 40 \leq y \leq 60 \quad (4.11)$$

$$\mu_H(y) = \frac{(y - 40)}{20} \quad \text{when } 40 \leq y \leq 60 \quad (4.12)$$

$$\mu_H(y) = \frac{(80 - y)}{20} \quad \text{when } 60 \leq y \leq 80 \quad (4.13)$$

$$\mu_{VH}(x) = \frac{(y - 60)}{20} \quad \text{when } 60 \leq y \leq 80 \quad (4.14)$$

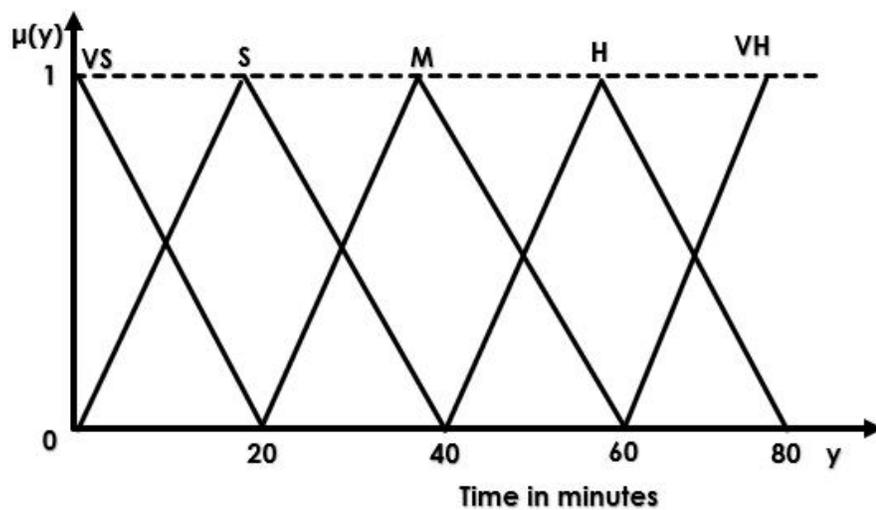


Figure 4.3: Wash-time graph

We could clearly get the membership functions of both the dirt and wash-time from the above graphs. We have also framed the following fuzzy rule base –

Table 4.1: Fuzzy Rule Table

DIRT	WASH-TIME
VLD	VS/S
LD	M
HD	H
VHD	H/VH

Rule 1: If the Dirtiness of cloth is Very Low then the Wash-time is Very Short or Short.

Rule 2: If the Dirtiness of cloth is Low then the Wash-time is Medium.

Rule 3: If the Dirtiness of cloth is High then the Wash-time is High.

Rule 4: If the Dirtiness of cloth is Very High then the Wash-time is High or Very High.

We have imprecise rules defined and hence they too are not crisp but fuzzy values. The 4 input parameters are detected by the sensors and then fuzzified as per the membership function of the respective variables. The corresponding rules are then evaluated and our system is a disjunctive system. So, the Mamdani approach is applied and rules are aggregated disjunctively. From this we defuzzify by substituting the obtained degree of membership value in the corresponding equations of wash-times and hence obtain the duration of wash-time required.

Now let us consider an example:

Let us assume 40 % of dirt. Comparing to the membership functions, we understand that 40 % lies between 30 % and 60 % of dirt. Taking the corresponding degrees of memberships, we have:

$$\mu_{LD}(x) = \frac{(60 - x)}{30} \quad \text{when } 30 \leq x \leq 60 \quad (4.15)$$

$$\mu_{HD}(x) = \frac{(x - 30)}{30} \quad \text{when } 30 \leq x \leq 60 \quad (4.16)$$

Substituting  $x = 40$ , for low dirt and high dirt values in the equations of degrees

of memberships, we get:

$$\mu_{LD}(x) = \frac{(60 - 40)}{30} = \frac{2}{3} \quad (4.17)$$

$$\mu_{HD}(x) = \frac{(40 - 30)}{30} = \frac{1}{3} \quad (4.18)$$

From the fuzzy rule base, we know that

Low Dirt  $\rightarrow$ Medium Wash-time AND High Dirt  $\rightarrow$ High Wash-time.

With Mamdani approach, we aggregate the rules, by disjunctive method:

Rule 2: If the Dirtiness of cloth is Low then the Wash-time is Medium( $y_1$ ).

Rule 3: If the Dirtiness of cloth is High then the Wash-time is High( $y_2$ ).

$$y_m = y_1 \cup y_2 \quad (4.19)$$

$$\mu_{y_m}(y) = \max [\mu_{y_1}(y), \mu_{y_2}(y)] = \max \left[ \frac{2}{3}, \frac{1}{3} \right] = \frac{2}{3} \quad (4.20)$$

$\rightarrow$ which is the degree of membership of low dirt.

Therefore, it requires medium wash-time duration.

Now substituting

$$\mu_M(y) = \frac{2}{3} \quad , \text{ in the equations:} \quad (4.21)$$

$$\mu_M(y) = \frac{(y - 20)}{20} \quad \text{when} \quad 20 \leq y \leq 40 \quad (4.22)$$

$$\frac{(y - 20)}{20} = \frac{2}{3} \rightarrow y = \frac{160}{3} \quad (4.23)$$

$$\mu_M(y) = \frac{(60 - y)}{20} \quad \text{when} \quad 40 \leq y \leq 60 \quad (4.24)$$

$$\frac{(60 - y)}{20} = \frac{2}{3} \rightarrow y = \frac{140}{3} \quad (4.25)$$

Taking the average, we get

$$\frac{\frac{160}{3} + \frac{140}{3}}{2} = 50 \quad \text{minutes} \quad (4.26)$$

## Chapter 5

# CONCLUSION

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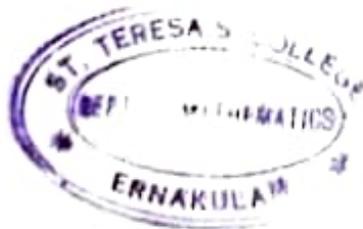
We have seen the application of Fuzzy Logic in washing machines. In the washing machine, various sensors are used to assess the different conditions inside the obscure logic machine and adjust its operation accordingly.

Similarly, it has numerous applications in facial pattern recognition, air conditioners, vacuum cleaners, antiskid braking systems, transmission systems, control of subway systems and unmanned helicopters and a number of knowledge-based applications for multi-objective optimization of power systems based on certain pre-defined conditions. Fuzzy logic is useful for many people involved in research and development. It can also be found in many engineering and scientific works.

Fuzzy logic will be applied to a wide range of systems and products in the future. Due to technological advancement and digital transformation, there is a large scope for fuzzy logic in the world.

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**ST. TERESA'S COLLEGE**  
**(AUTONOMOUS)**  
**AFFILIATED TO MAHATMA GANDHI UNIVERSITY**



**RAPID (QUICK  
SERVICES)  
PROJECT REPORT**

**In partial fulfilment of the requirements for the award of the degree of**

**BACHELOR OF VOCATION IN  
SOFTWARE DEVELOPMENT**

**By**

**LAKSHMI III BVoc Software Development Register No: VB19SWD010**

**Under the guidance of Mrs. Elizabeth Paul**

**DEPARTMENT OF COMPUTER APPLICATIONS  
2021-2022**



An ISO 9001:2015 Certified Company



APRIL 5, 2022

**TO WHOM SO EVER IT MAY**  
**CONCERN**

This is to certify that **LAKSHMI**, 6<sup>th</sup> Semester, **BVOC – Software Development** student of **ST. TERESA’S COLLEGE, ERNAKULAM** has successfully completed a project titled “**QUICK SERVICES**” from our organization.

The duration of the project was for 3 months. The Project was incorporated in **JAVA, ANDROID** and was implemented successfully.

Thanking you,

For **LCC Computer Education**

A handwritten signature in black ink, appearing to read 'T.S. Ramaswamy'.

**T.S.**  
**Ramaswamy**  
**Director**



**Cochin Office** : 3<sup>rd</sup> Floor, Dharmodayam Buildings, Marine Drive, Cochin – 682031. INDIA Phone Off : +91 484 2355545 E-mail: info@lcccochin.com

# CERTIFICATE

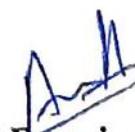


This is to certify that the project report entitled "QUICK SERVICES", a bonafide record of the work done by LAKSHMI during the year 2021-22 and submitted in partial fulfilment of the requirements for the degree of Bachelor of Vocational Software Development under Mahatma Gandhi University.

**Head of the Department**

  
**Internal Examiner**



  
**External Examiner**

# DECLARATION

I, LAKSHMI (Register no: VB19SWD010 ), BVoc. Software Development final year student of St. Teresa's College (Autonomous), Ernakulam, hereby declare that the project submitted named LAKSHMI for the Bachelor's Degree in Software Development is my original work. I further declare that the said work has not previously been submitted to any other university or academic body.

Place : Ernakulam

Date : 06-04-2022



LAKSHMI

# **ACKNOWLEDGEMENT**

In this humble endeavour I have received a great deal of support and guidance from different quarters. First and foremost I thank the God almighty, for bestowing upon me abundance of grace, wisdom and power throughout the study and making it a success.

I am extremely grateful to my Director Rev. Dr. Sr. Vinitha (CSST) and principle Dr. Lizzy Mathew for giving me this opportunity.

I take this opportunity to express my profound sense of gratitude and indebtedness to the Head of the Department of Computer Applications Mrs RAJI S PILLAI, my project guide

Mrs Elizabeth and all the teaching faculty, for the encouragement and guidance in accomplishing the work.

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Last but not the least, I would like to thank my parents and friends for motivating me and providing me the right environment for making this project work a great success.

**LAKSHMI**

## **SYNOPSIS**

Through this app the user can find out the nearest washing centre or car repair centre from users current location, i.e., these service providers comes to our location. These apps are very much loved by the users as they save their time and provide the services at the moment they require.

The graphical representation of the application is the main part of the system as it appeals to the user more and is easy to understand.

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# 1. INTRODUCTION

## 1.1 OVERVIEW OF THE SYSTEM

Through this app the user can find out the nearest washing centre or car repair centre from users current location, ie these service providers comes to our location. These apps are very much loved by the users as they save their time and provide the services at the moment they require Mobile Car Services is one of the features in the automobile industry that lets you find the right dealers from the application.

End Users & Dealers needs to register in the application and customers can schedule the car service at his own priority times.

The aim of the study is to propose a Mobile Application to bring the dealers and customers on one platform with minimal cost. It brings cleaning service at your doorsteps and also saves your energy.

The admin module is the most important module in the project. It manages the information regarding the approval and disapproval of the dealers. This module maintains the record regarding the bookings made by the customer, the total number of dealers and also it maintains a record for the pending requests of dealers.

Manage user feedback about services

Adding Fuel rate to car services. User can login with authenticate details of registration and check the nearest location to request the car service. if service provider got the request from the user they will be reache user Location with GPS Tracker.

## 2. SYSTEM ANALYSIS

### 2.1 INTRODUCCION

The first step in the system study includes analysis of the system. System analysis involves studying the way an organization currently receives and process data to produce information with the goal of determining how to make it work better. System analysis includes both a preliminary and a detailed stage. During preliminary analysis the analysis takes a quick look at what is needed and whether it benefits the perceived want. Detailed analysis includes an in depth look at what is wanted and contains more refined cost and benefits studies. The preliminary analysis begins when someone perceives a problem, modifications to existing, repairs to an existing system or demands an entirely new system. The analyst summarizes the gained modifications, including personal requirements and potential benefits of the new system in formal report called the preliminary report. Detailed analysis expands the preliminary efforts to include the complete analysis of all possible alternative solutions to the problem and complete expansion of what appears to the most practical solution.

The system study is the process of gathering and interpreting facts, using this information for further studies on the system. It does various feasibility studies. In these studies, a rough figure of the system activities can be obtained, from which the decisions about the strategies to be followed for effective system study and analysis can be taken. The system study also identifies the method collection to be followed. The system study conducted an initial picture about the system working was got. From the information got form the study, the data collection methods are identified. Even in the first investigation itself drawbacks of the existing system could be identified.

## **2.2 EXISTING SYSTEM**

Existing paper investigates the determinants of customer choice of a car maintenance service provider after the warranty period. It focuses on the alternative of using branded car dealers, who provide this service during the warranty period, or independent garages. Design/methodology/approach – A comprehensive list of 30 service attributes is developed drawing on the service quality literature, specific previous studies on car maintenance services, and including other purchase behaviour determinants such as perceived value. Simple random sampling with replacement is used to collect data from 400 car owners using the actual choice of a service provider as the dependent variable. A quantitative analysis using a set of logistic regressions links directly customer choice to the service attributes.

## **2.3 PROPOSED SYSTEM**

The purpose of this project is to provide car or any other automobile servicing system more effectively than the existing system. There are some disadvantages of the existing Car service center. These disadvantages are overcome by car services with our mobile application. And it can be made handily available to every person with their current Location by GPS, Here Admin Can add fuel rate to all services from current updation. Customer can track urgent services by nearest location center. Thus our system reduce time and expense charge with their current location.

## **2.4 SYSTEM SPECIFICATION**

A software requirement specification (SRS), a requirements specification for a software system, is a complete description of the behavior of a system to be developed and may include a set of use cases that describe interactions the users will have with the software. In addition, it also contains non-functional requirements. Non-functional requirements impose constraints on the design or implementation (such as performance engineering requirements, quality standards, or design constraints) The software requirements specification document enlists all necessary requirements that are required for the project development.

## **2.5 SOFTWARE SPECIFICATION**

The selection of hardware is very important in the existence and proper working of any software. When selecting hardware, the size and capacity requirements are also important. Below are some of the hardware that is required by the system.

## **2.6 HARDWARE SPECIFICATION**

The most common set of requirements defined by any operating system or software application is the physical computer resources, also known as hardware. A hardware requirements list is often accompanied by a hardware compatibility list (HCL), especially in case of operating systems. An HCL lists tested, compatible, and sometimes incompatible hardware devices for a particular operating system or application.

### **ABOUT THE SOFTWARE TOOLS AND PLATFORM**

It is very important to select appropriate software so that the software works properly.

### **FRONT END: ANDROID**

Android is a Linux based operating system designed primarily for touch screen mobile devices such as smart phones and tablet computers. Android is open source and Google releases the code under the Apache License. This open-source code and permissive licensing allows the software to be freely modified and distributed by device manufacturers, wireless carriers and enthusiast developers. Additionally, Android has a large community of developers writing applications that extend the functionality of devices, written primarily in a customized version of the Java programming language. Android is an open-source mobile operating system that combines and builds up on parts of many different open-source projects.

Android's kernel is based on the Linux kernel and has further architecture changes by Google outside the typical Linux kernel development cycle. Android does not have a native Window System nor does it support the full set of standard GNU libraries, and this makes it difficult to port existing Linux applications or libraries to Android. Android's user interface is based on direct manipulation using touch inputs that loosely correspond to real-world actions, like swiping, tapping, pinching and reverse pinching to manipulate on-screen objects.

## **ABOUT JAVA**

Java is a general-purpose computer-programming language that is concurrent, class-based, object-oriented, and specifically designed to have as few implementation dependencies as possible. It is intended to let application developers "write once, run anywhere" (WORA), meaning that compiled Java code can run on all platforms that support Java without the need for recompilation. Java applications are typically compiled to bytecode that can run on any Java virtual machine (JVM) regardless of computer architecture. As of 2016, Java is one of the most popular programming languages in use, particularly for client-server web applications, with a reported 9 million developers. Java was originally developed by James Gosling, a Canadian, at Sun Microsystems (which has since been acquired by Oracle Corporation) and released in 1995 as a core component of Sun Microsystems' Java platform. The language derives much of its original features from Smalltalk, with a syntax similar to C and C++, but it has fewer low-level facilities than either of them.

## **ABOUT ANDROID**

Android is a Linux-based operating system designed primarily for touch screen mobile devices such as Smartphone and tablet computers. Initially developed by Android, Inc., which Google backed financially and later bought in 2005. Android is open source and Google releases the code under the Apache License. This open-source code and permissive licensing allows the software to be freely modified and distributed by device manufacturers.

Wireless carriers and enthusiast developers. Additionally, Android has a large community of developers writing applications ("apps") that extend the functionality of devices, written primarily in a customized version of the Java programming language.

Android Studio is Android's official IDE. It is purpose-built for Android to accelerate your development and help you build the highest-quality apps for every Android device.

Android Studio's Instant Run feature pushes code and resource changes to your running app. It intelligently understands the changes and often delivers them without restarting your app or rebuilding your APK, so you can see the effects immediately.

## **ABOUT MySQL**

MySQL is a relational database management system (RDBMS) which is more than 11 million institutions. The program runs as a server providing multi-user access to a number of databases.

MySQL is owned and sponsored by a single for-profit firm, the Swedish company MySQL AB, now a subsidiary of Sun Microsystems, which holds the copyright to most of the code base. The project's source code is available under terms of the GNU General Public License, as well as under a variety of proprietary agreements.

## **SELECTION OF OPERATING SYSTEM**

### Windows10 an Overview

Windows 10 includes improved network, application and Web services. It provides increased reliability and scalability, lowers your cost of computing with powerful, flexible management services, and provides the best foundation for running business application.

### Network Data Security

Network data can be protected on the wire or at the network interface. Securing data at the network requires a firewall to proxy services and mediate connections between the internal network, (LAN) and external network (Internet). This is the purpose of Proxy Server.

### Internet Protocol Security

Internet Protocol Security (IPsec) is a framework of open standards for ensuring secure private communications over Internet Protocol networks, using cryptographic security services.

## 3. SYSTEM DESIGN

### 3.1 INTRODUCTION

System design is an interactive process through which requirements are transmitted to a “blue print” for constructing the software initial; the blue print depicts a holistic view of software that is design is represented at a high-level abstraction a level that can be directly traced to specific data, functional and behavioral requirements. System design is the solution to the creation of a new system. This is the important aspect made up of several steps. System design is the process of developing specifications for a candidate system that meet the criteria established in the system analysis. Major step in system design is the preparation of the input forms and output reports in a form applicable to the users.

Some of the main factors that have to be noted using the design of the system are:

- Practicability
- System must be capable of being operated over a long period of time and must have ease of use.
- Efficiency
- Make better use of available resources. Efficiency involves accuracy, timeliness and comparability of system output.
- Cost
- Aim of minimum cost and better results.
- Security
- Ensure physical security of data.

### 3.2 INPUT DESIGN

Input design is the process of converting user-oriented input to a based format. Inaccurate input data are the most common cause of errors in data processing. Errors entered by data entry operators can be controlled by input design. The goal of designing input data is to make data entry as easy, logical and free from errors. When we approach input data design; we design the data source documents that capture the data and then select the media used to enter them into computer.

User-friendly screen format can reduce the burden on end users, who are not highly proficient in computers. An important step in input design stage is a design of source document. Source document is the form in which the data can initially capture. The next step is the design of the document layout. In the layout organizes the document by placing information, where it will be noticed and establishes the appropriate sequence of items.

### 3.3 OUTPUT DESIGN

Computer output is the most important and direct source of information to the user. Efficient and intelligent output design improves the system's relationship and helps user decision-making.

In the output design it is determine how the implementation is to be played for immediate need and also the hardcopy output. A major form of input is a hardcopy from the printer. Print- outs should be designed around the output requirement of the user. Printers, CRT screen display are the examples for providing computer-based output. The output design associated with the system includes the various reports of the table generations and query executions.

A quality output is one, which meets the requirements of end user and presents the information clearly. In any system result of processing are communicated to the user and to the other system through outputs. In the output design it is determined how the information is to be displayed for immediate need. It is the most important and direct source information to the user. Efficient and intelligent output design improves the system's relationships with the user and helps in decision –making. The objective of the output design is to convey the information of all the past activities, current status and to emphasis important events. The output generally refers to the results and information that is generated from the system. Outputs from computers are required primarily to communicate the results of processing to the users.

### **3.4 DATABASE DESIGN**

The Database design is the process of producing a detailed data model of a database. The logical data model contains all the needed logical and physical design choices and physical storage parameters needed to generate a design in a Data Definition Language, which can then be used to create a database. A fully attributes for each entry. The term database design can be used to describe many different parts of the design of an overall database system. Principally, and most correctly, it can be thought of as the logical design of the base data structures used to store the data. In the relational model, these are the tables and views. In an object database, the entities and relationships map directly to object classes and named relationships. However, the term database design could also be used to apply to the overall process of designing, not just the base data structures, but also the forms and queries used as part of the overall data base applications within the database management system.

#### **DATA FLOW DIAGRAM**

DFD models a system transforms the data and creates, output data-flows which go by suing external entities from which data flows to a process which to other processes or external entities or files. Data in files many also flow to processes as inputs. There are various symbols used in DFD. Bubbles represent the process. Named arrows indicate the dataflow. External entities are represented by rectangles and are outside the system such as vendors or customers with whom the system interacts.

## BASIC DFD SYMBOLS

### Square:



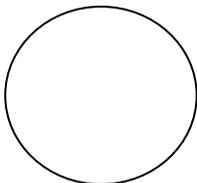
Entity is a person or part of an organization, which enters or receives information from the system, but is considered to be outside the context of data flow model

### Arrow:



A data flow is a route, which enables packets of data to travel from one point to another. Data may flow from a source to a processor and from data store or process. An arrow lines depicts the flow, with arrowhead pointing in the direction of flow

### Circle:



A Process represents transformation where incoming data flows are changed into outgoing data flows.

### Open rectangle:



A data store is a repository of data that is to be stored for use by one or more process may be as simple as buffer or queue or sophisticated as relational database. They should have clear names. If a process merely uses the content of store and doesn't alter it, the arrowhead goes only from the store to the process. If process alters the details in the store, then a double-headed arrow is used.

## **3.5 NORMALIZATION**

The process of normalization is concerned with the transformation of the conceptual schema to a computer represent able form. Normalization reduces the redundancies and anomalies.

### **THE FIRST NORMAL FORM**

First Normal form does not allow multivalued and composite valued attributes. It states that the domain of an attribute must include only atomic values and that value of any attribute in a table must be single value from the domain of that attribute.

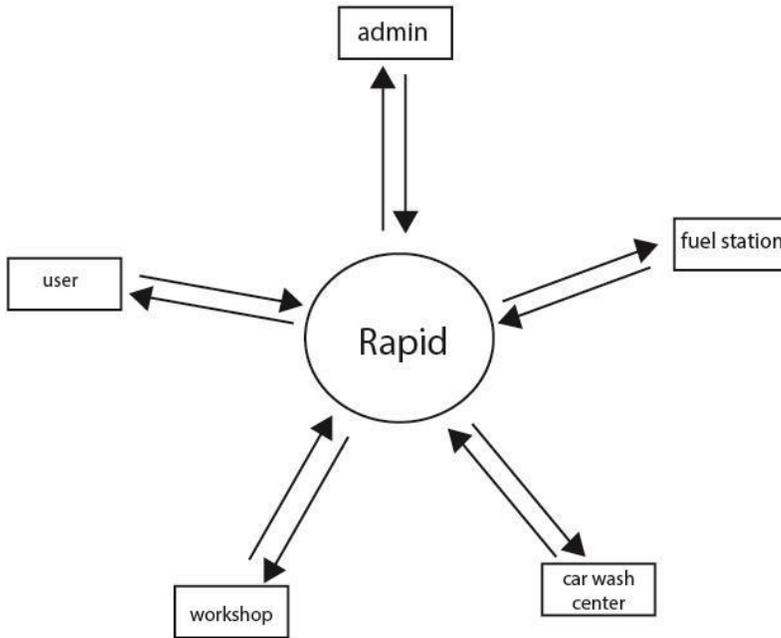
### **THE SECOND NORMAL FORM**

In Second Normal form, for relation where primary key contains multiple attributes, on key attribute should not be functionally dependent on a part of the primary key.

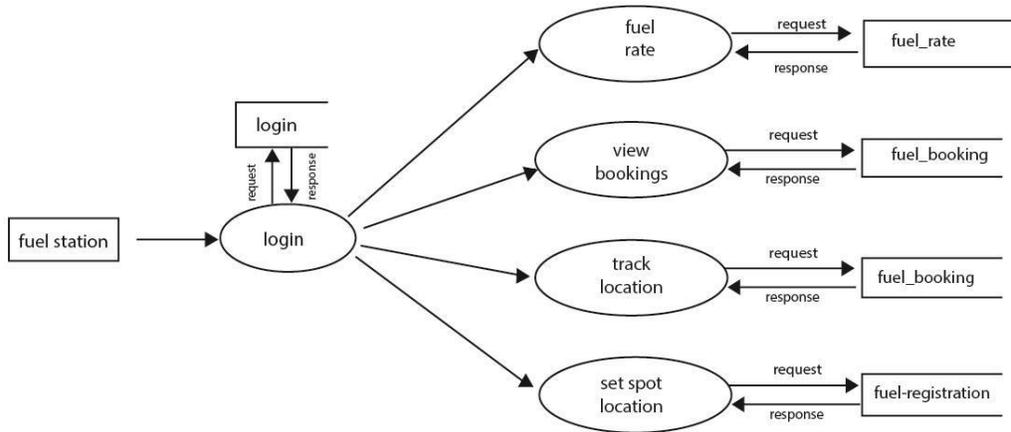
### **THE THIRD NORMAL FORM**

In Third Normal form, relation should not have a non-key attribute functionally determined by non-key attribute. That is there should be no transitive dependency of a non-key attribute on the primary key

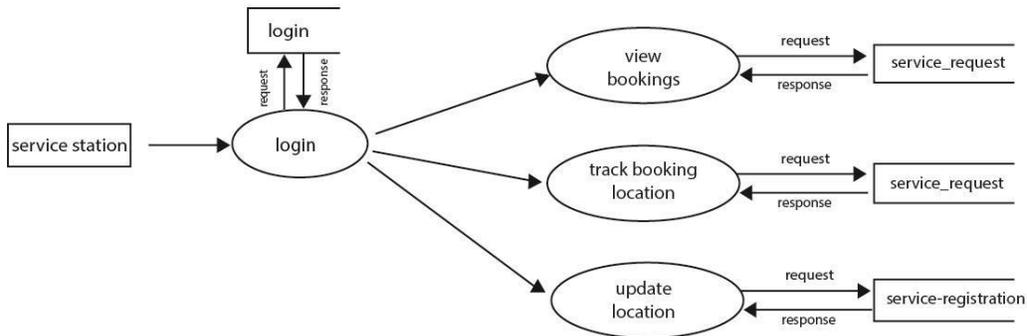
### 3.6 DATAFLOW DIAGRAMS



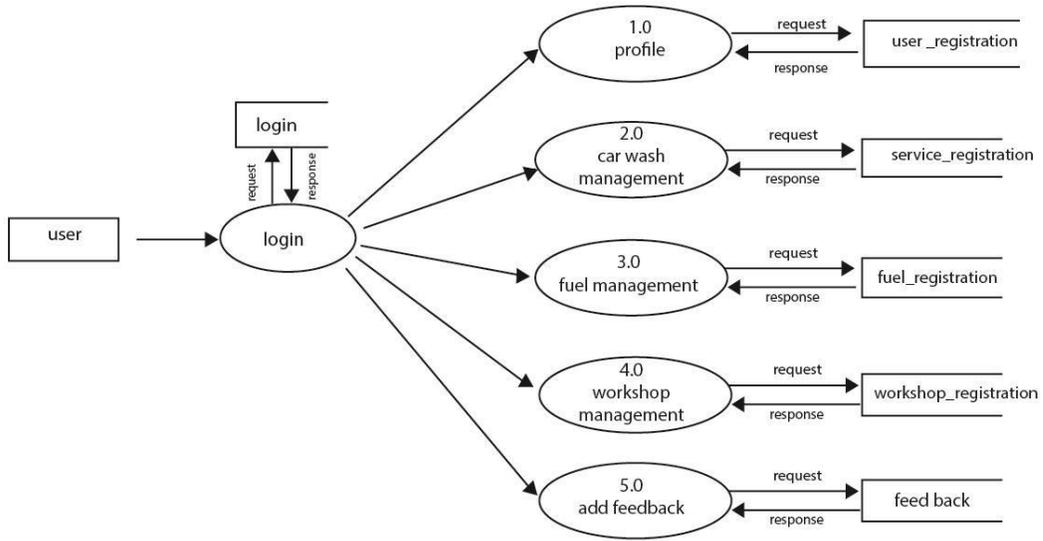
Level 1 fuel station



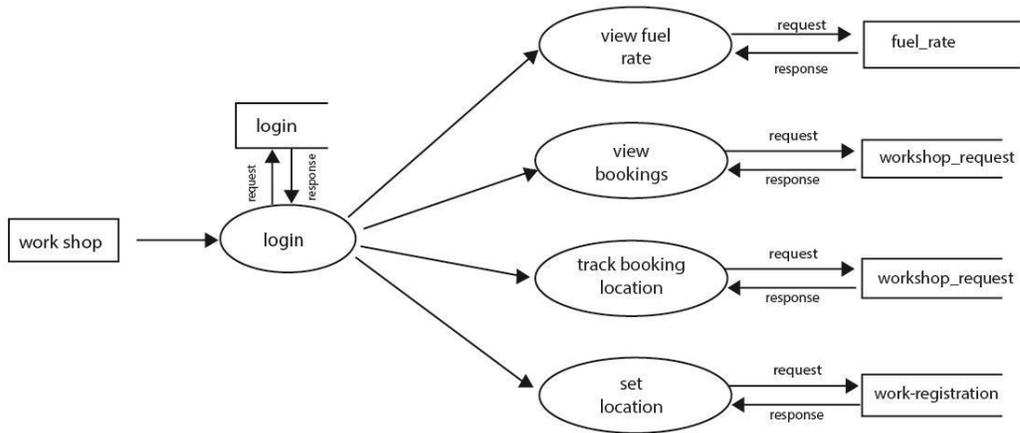
Level 1 service station



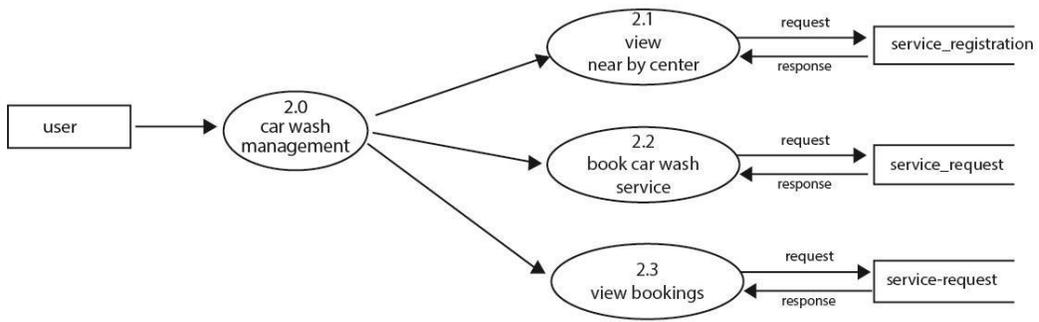
Level 1 user



Level 1 work shop



Level 2 user



## 3.7 TABLE DESIGN

### login

Field	Type	Null	Default
logid	int(11)	No	
uid	int(20)	Yes	NULL
username	varchar(30)	Yes	NULL
password	varchar(30)	Yes	NULL
type	varchar(30)	Yes	NULL
status	varchar(30)	Yes	1

### fuel\_booking

Field	Type	Null	Default
bid	int(11)	No	
uid	varchar(20)	Yes	NULL
fid	varchar(30)	Yes	NULL
type	varchar(30)	Yes	NULL
ltr	varchar(30)	Yes	NULL
charge	varchar(30)	Yes	NULL
date	varchar(30)	Yes	NULL
latt	varchar(20)	Yes	NULL
longg	varchar(20)	Yes	NULL
status	varchar(20)	Yes	0

### fuel\_rates

Field	Type	Null	Default
fid	bigint(20)	No	
district	varchar(80)	Yes	NULL
price_petrol	varchar(30)	Yes	90
price_diesel	varchar(30)	Yes	85

### servies\_request

Field	Type	Null	Default
rid	int(11)	No	
uid	varchar(30)	Yes	NULL
sid	varchar(30)	Yes	NULL
date	varchar(30)	Yes	NULL
latt	varchar(30)	Yes	NULL
longg	varchar(30)	Yes	NULL
status	varchar(30)	Yes	0

**user\_registration**

Field	Type	Null	Default
uid	int(11)	No	
name	varchar(30)	Yes	NULL
gender	varchar(30)	Yes	NULL
aadhaar	varchar(50)	Yes	NULL
phone	varchar(30)	Yes	NULL
email	varchar(30)	Yes	NULL
password	varchar(30)	Yes	NULL

**servies\_registration**

Field	Type	Null	Default
sid	int(11)	No	
name	varchar(30)	Yes	NULL
manager	varchar(30)	Yes	NULL
location	varchar(50)	Yes	NULL
phone	varchar(30)	Yes	NULL
latt	varchar(30)	Yes	NULL
longg	varchar(30)	Yes	NULL
password	varchar(30)	Yes	NULL

**fuel\_registration**

Field	Type	Null	Default
fid	int(11)	No	
name	varchar(30)	Yes	NULL
manager	varchar(30)	Yes	NULL
location	varchar(50)	Yes	NULL
phone	varchar(30)	Yes	NULL
latt	varchar(30)	Yes	NULL
longg	varchar(30)	Yes	NULL
password	varchar(30)	Yes	NULL

## 4. SYSTEM DEVELOPMENT

### 4.1 MODULE DESCRIPTION

#### MODULES

##### The Customer Panel:

**Sign-up/login:** This is the first section where the users will land on. They can register into the app with the social network and email account details.

**Place service request:** Users can place the request for car washing or car repair according to the solutions provided by the different service providers.

**Select car location:** Users can select the location of the car that requires servicing and washing. So that accordingly, technicians can make the provisions for cleaning.

**Select package and services:** Users can select the packages and services that are outlined by the different service providers and select the best that fits with their financial requirements.

**Check technician availability:** Accordingly user can check the technician, if he is available for washing the car or repair. This way it becomes easier for the users to place a request for car washing or repair in a convenient way.

**Make payments:** Users can make the payments through the online payment models such as credit/debit card, Payment gateways for availing the services.

**View order history:** The users can view the history of the order. All the orders request can be viewed by them and they can accordingly make the new requests for the car washing or car repairing.

### **Detailer Panel**

**Sign-up:** Similar to the user panel, the service provider of the detailer can log in with the username and password provided by the admin.

**Add service location:** Detailers can add the location of the services so as to allow the user to make a request for the service centres that are nearby.

**Push notifications:** Detailers can send the notification to the users once the orders have been received. The users are also notified in case the car washing or repairing is completed.

**Accept/reject service:** As per the number of requests and the ones that are aligned with the immediate deliveries, the detailer can accept or reject requests assigned by the user or admin.

**View completed job history:** Detailers can check the number of requests completed along with the date and time specifications so as to keep the track of number of requests executed per day.

**Request payment from admin:** According the number of requests completed the detailer can send the request to the admin for making payments.

### **Admin Panel**

**Registering of technician:** Admin can track all the technicians that are associated with a panel along with their year of experience and the physical location. Manage services. All the services that are provided by the service providers along with the charges are managed by the admin.

**Manage service time zones:** The operational time zones of the service provider or the detailer is managed and tracked by the admin to manage user jobs. All the jobs that are assigned by the user related to the car washing and repair servicing are managed and monitored by the admin.

**Manage user payment:** Under this section, the payments made by the user through the online models and gateway are stored by the admin.

**Manage rating and feedbacks:** Ratings and the feedback provided by the users associated with the service provided are reviewed by the admin.

## 5. SYSTEM IMPLEMENTATION

### 5.1 TESTING

Testing is an important stage in the software development life cycle. System testing is a critical element of a software quality assurance and represents the ultimate review of specification, design and coding.

Importance of software testing and its implication with software quality cannot be over-estimated. Testing is one-way developers can validate the quality of a software product and verify that it fully meets the specification.

The software testing methodology is applied in four distinct phases:

- Unit Testing
- Integration Testing
- User Acceptance Testing
- Output Testing

#### Unit Testing

Developers typically do unit testing in order to trace out bugs in each module of the code. Unit testing is done in parallel with coding. It includes testing each function and procedures. Unit testing is also called as module testing. In module testing each module are tested for any possible logical error. They are also tested for specification to see if they are working as per the program should do and they are tested under various conditions.

#### Integration Testing

Integration testing is any type of software testing that seeks to verify the interfaces between components against a software design. Software components may be integrated in an iterative way or all together ("big bang"). Normally the former is considered a better practice since it allows interface issues to be located more quickly and fixed. Integration testing works to expose defects in the interfaces and interaction between integrated components (modules).

### **User Acceptance Testing**

User acceptance testing is done by the user to check whether the project has met the requirement that has been mentioned at the beginning of the project. Flood alert is tested by the user by inputting values and the result generated is also validated. If the accuracy is as expected user approve the system.

### **Output Testing**

After performing the validation testing, the next step is output testing of the proposed system since no system could be useful if it does not produce the required output in the specific format. The output generated or displayed by the system under consideration is tested asking the users about the format required by them. Here, the output is considered in two ways, one is on the screen and other is printed format.

## **5.2 VALIDATION CHECK**

The validation phase reveals the failures and the buds in the developed system. It will become to known about the practical difficulties the system faces when the operated in the true environment. Validation is the process of ensuring that user input is clean, correct, and useful

Typical validation tasks are:

Has the user filled in all required fields?

Has the user entered a valid email?

Has the user entered text in a numeric field?

Form validation normally used to occur at the server, after the client had entered all the necessary data and then pressed the submit button. If the data entered by a client was incorrect or was simply missing, the server would have to send all the data back to the client and request that the form be resubmitted with correct information. This was really a lengthy process which used to put a lot of burden on the server. Most often, the purpose of validation is to ensure correct user input. Validation can be defined by many different methods, and deployed in many different ways. Server-side validation is performed by a web server, after input has been sent to the server. Client-side validation is performed by a web browser, before input is sent to a webserver.

### **5.3 SYSTEM IMPLEMENTATION**

The implementation phase of the software development is concerned with translating design specification into source code. The user tests the developed system and changes are made according to their needs. Our system has been successfully implemented. Before implementation several tests have been conducted to ensure that no errors are encountered during the operation. The implementation phase ends with an evaluation of the system after placing into the operation for a period of time.

The process of putting the developed system in actual use is called system implementation. This includes all those activities that take place to convert from old system to new system. The system can be implemented only after testing is done and is found to be working to specifications. The implementation stage is a systems project in its own right. The implementation stage involves following tasks:

Careful planning.

Investigation of system and constraints.

Design of method to achieve change over.

Evaluation of the changeover metho

## **6. SYSTEM MAINTENANCE AND FUTURE ENHANCEMENT**

### **6.1 SYSTEM MAINTENANCE**

System maintenance is a going activity, which covers a wide variety of activities including, removing program and design errors, updating documentation and test data and updating user support system maintenance is a catchall term used to describe various forms of computer or server maintenance required to keep a computer system running properly, it can describe network maintenance which could mean that servers are being physical repaired, replaced or mode. For the purpose of convenience, maintenance may be categorized into three classes they are:

#### **CORRECTIVE MAINTENANCE**

This type of maintenance implies removing errors in a program, which might have kept in the system due to faulty design or wrong assumption.

#### **ADAPTIVE MAINTENANCE**

In adaptive maintenance program functions are changed to enable the information system to satisfy the information needs of the user.

#### **PERFECTIVE MAINTENANCE**

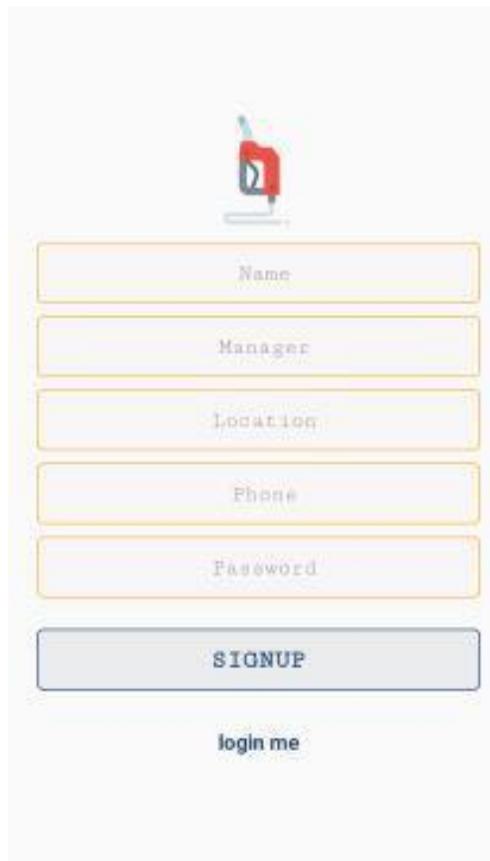
In perfective maintenance means adding new programs or modifying the existing programs to enhance the performance of the information system.

### **6.2 FUTURE ENHANCEMENTS**

Car Service repair and prevention tasks are well within the skill of anyone who can drive the vehicle and can save the owner the hassle and expense of going to the shop. Changing fluids and filters and paying attention to the sounds, smells, and sensations felt through the vehicle goes a long way toward increasing vehicle longevity and directing informed maintenance choices. Likewise, knowing a little more about the issues that create safety hazards and how to respond to them by seeking appropriate professional repairs allows the owner to maximize safety for both drivers and passengers alike.

## 7. APPENDICES

### 7.1 SAMPLE INPUT DESIGN OUTPUT DESIGN



Name

Manager

Location

Phone

Password

**SIGNUP**

[login me](#)



Name

Manager

Location

Phone

Password

**SIGNUP**

[login me](#)

### Fuel Home

---



Fuel Rate



Bookings



Set Location



Not a member?  
[create an account](#)

Gender:  Male  Female

[login me](#)

**Send Feedback**

Subject:

Enter Description:

★ ★ ★ ★ ★

**PROFILE**



Name:

Gender:

Aadhar:

Phone:

Email:

### Fuel Rate

Petrol  Diesel

Select District

Rate

## 7.2 SOURCE CODE

```
package com.syntax.rapid;

import android.Manifest;
import android.app.Dialog;
import android.content.Context;
import android.content.Intent;
import android.content.SharedPreferences;
import android.content.pm.PackageManager;
import android.os.Build;
import android.os.Bundle;
import android.util.Log;
import android.view.MotionEvent;
import android.view.View;
import android.view.Window;
import android.view.WindowManager;
import android.widget.Button;
import android.widget.EditText;
import android.widget.LinearLayout;
import android.widget.TextView;
import android.widget.Toast;

import androidx.appcompat.app.ActionBar;
import androidx.appcompat.app.AppCompatActivity;
import androidx.core.app.ActivityCompat;

import com.android.volley.AuthFailureError;
import com.android.volley.Request;
import com.android.volley.RequestQueue;
import com.android.volley.Response;
import com.android.volley.VolleyError;
import com.android.volley.toolbox.StringRequest;
import com.android.volley.toolbox.Volley;
import com.syntax.rapid.Admin.AdminHome;
import com.syntax.rapid.Common.Utility;
```

```

import com.syntax.rapid.FuelStation.FuelHome;
import com.syntax.rapid.FuelStation.Fuel_Registration;
import com.syntax.rapid.ServiesStaion.ServiesHome;
import com.syntax.rapid.ServiesStaion.Servies_Registration;
import com.syntax.rapid.User.UserHome;
import com.syntax.rapid.User.UserRegistration;
import com.syntax.rapid.WorkShop.WorkshopHome;
import com.syntax.rapid.WorkShop.Workshop_Registration;

```

```

import java.util.HashMap;
import java.util.Map;

```

```

public class Login extends AppCompatActivity {

```

```

    EditText username, password;
    Button btnlog;
    TextView reg;
    Dialog dialog;

```

```

    String UNAME, PASS;

```

```

    @Override

```

```

    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);

```

```

        requestWindowFeature(Window.FEATURE_NO_TITLE);
        getWindow().setFlags(WindowManager.LayoutParams.FLAG_FULLSCREEN,
            WindowManager.LayoutParams.FLAG_FULLSCREEN);

```

```

        setContentView(R.layout.activity_login);
        ActionBar actionBar=getSupportActionBar();
        actionBar.hide();

```

```

        username = findViewById(R.id.login_username);
        password = findViewById(R.id.login_password);
        btnlog = findViewById(R.id.login_btnlog);

```

```

reg = findViewById(R.id.login_signup);

int PERMISSION_ALL = 1;
String[] PERMISSIONS = {
    Manifest.permission.WRITE_EXTERNAL_STORAGE,
    Manifest.permission.READ_EXTERNAL_STORAGE,
    Manifest.permission.ACCESS_FINE_LOCATION,
    Manifest.permission.ACCESS_COARSE_LOCATION,
};

if (!hasPermissions(this, PERMISSIONS)) {
    ActivityCompat.requestPermissions(this, PERMISSIONS, PERMISSION_ALL);
}

btnlog.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View view) {
        UNAME = username.getText().toString();
        PASS = password.getText().toString();
        if (UNAME.isEmpty()) {
            username.requestFocus();
            username.setError("enter username");
        } else if (PASS.isEmpty()) {
            password.requestFocus();
            password.setError("enter password");
        } else {
            login();
        }
    }
});

reg.setOnTouchListener(new View.OnTouchListener() {
    @Override
    public boolean onTouch(View view, MotionEvent motionEvent) {

```

```

        showCustomDialog();
        return false;
    }
});

}

protected void showCustomDialog() {
    // TODO Auto-generated method stub
    // final Dialog dialog = new Dialog(User_View_Recipie_Details.this);
    dialog = new Dialog(Login.this);
    dialog.requestWindowFeature(Window.FEATURE_NO_TITLE);
    dialog setContentView(R.layout.custom_reg_option);

    //
    dialog.getWindow().setBackgroundDrawableResource(android.R.color.transparent);

    //final String pid=Pid;

    final LinearLayout user=dialog.findViewById(R.id.cus_reg_user);
    final LinearLayout fuel = dialog.findViewById(R.id.cus_reg_petrol);
    final LinearLayout servies = dialog.findViewById(R.id.cus_reg_servies);
    final LinearLayout workshop = dialog.findViewById(R.id.cus_reg_workshop);

    user.setOnTouchListener(new View.OnTouchListener() {
        @Override
        public boolean onTouch(View view, MotionEvent motionEvent) {
            startActivity(new Intent(getApplicationContext(), UserRegistration.class));
            dialog.cancel();
            return false;
        }
    });
    fuel.setOnTouchListener(new View.OnTouchListener() {

```

```

    @Override
    public boolean onTouch(View view, MotionEvent motionEvent) {
        startActivity(new Intent(getApplicationContext(), Fuel_Registration.class));
        dialog.cancel();
        return false;
    }
});
services.setOnTouchListener(new View.OnTouchListener() {
    @Override
    public boolean onTouch(View view, MotionEvent motionEvent) {
        startActivity(new Intent(getApplicationContext(), Servies_Registration.class));
        dialog.cancel();
        return false;
    }
});
workshop.setOnTouchListener(new View.OnTouchListener() {
    @Override
    public boolean onTouch(View view, MotionEvent motionEvent) {
        startActivity(new Intent(getApplicationContext(),
Workshop_Registration.class));
        dialog.cancel();
        return false;
    }
});

    dialog.show();
}

public void login() {

    RequestQueue queue = Volley.newRequestQueue(getApplicationContext());
    StringRequest request = new StringRequest(Request.Method.POST, Utility.url,
new Response.Listener<String>() {
        @Override
        public void onResponse(String response) {
            Log.d("*****", response);
        }
    });
}

```

```

if (!response.trim().equals("failed")) {

    String data = response;
    String arr[] = data.trim().split(":");

    SharedPreferences.Editor editor = getSharedPreferences("SharedData",
MODE_PRIVATE).edit();
    editor.putString("logid", "" + arr[0]);
    editor.putString("type", "" + arr[1]);
    editor.commit();
    if (arr[1].equals("admin")) {
        startActivity(new Intent(Login.this, AdminHome.class));
    }else if(arr[1].equals("fuel")){
        startActivity(new Intent(Login.this, FuelHome.class));
    }else if(arr[1].equals("servies")){
        startActivity(new Intent(Login.this, ServiesHome.class));
    }else if(arr[1].equals("user")){
        startActivity(new Intent(Login.this, UserHome.class));
    }else if(arr[1].equals("workshop")){
        startActivity(new Intent(Login.this, WorkshopHome.class));
    }
} else {
    Toast.makeText(getApplicationContext(), "Login failed..!",
Toast.LENGTH_LONG).show();
}
}, new Response.ErrorListener() {
    @Override
    public void onErrorResponse(VolleyError error) {

        Toast.makeText(getApplicationContext(), "my error :" + error,
Toast.LENGTH_LONG).show();
        Log.i("My error", "" + error);
    }
}) {
    @Override
    protected Map<String, String> getParams() throws AuthFailureError {

```

```
    Map<String, String> map = new HashMap<String, String>();
    map.put("key", "login");
    map.put("username", UNAME);
    map.put("password", PASS);

    return map;
}
};
queue.add(request);
}

public static boolean hasPermissions(Context context, String... permissions) {
    if (Build.VERSION.SDK_INT >= Build.VERSION_CODES.M && context != null &&
permissions != null) {
        for (String permission : permissions) {
            if (ActivityCompat.checkSelfPermission(context, permission) !=
PackageManager.PERMISSION_GRANTED) {
                return false;
            }
        }
    }
    return true;
}
}
```

## 8. CONCLUSION

Car Regular maintenance doesn't cost much but unexpected repairs and replacements can be expensive. Engine and other components don't fail without a reason. When you neglect maintenance, it gives way to minor problems developing that can become major with continued neglect of vehicle maintenance. Regular maintenance of your vehicle gives you an opportunity to check whether there are any signs of minor problems like cracks, leaks, as well as excessive wear and tear due to friction. If you pay attention to these things and perform repairs, the specific part can be saved and you will not need a replacement for a long time.

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**DIGITAL THERMOMETER USING ARDUINO AND LM35**  
**TEMPERATURE SENSOR**

**PROJECT REPORT**

Submitted by

**LAKSHMI KV**

**Reg.No: AB19PHY008**

Under the guidance of

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In partial fulfilment of the requirement for the Award of

**BACHELOR'S DEGREE OF SCIENCE IN PHYSICS**



**ST.TERESA'S COLLEGE (AUTONOMOUS)  
ERNAKULAM**



**CERTIFICATE**

This is to certify that the project report entitled “**DIGITAL THERMOMETER USING ARDUINO AND LM35 TEMPERATURE SENSOR** “ is a bonafide work by Lakshmi KV, St.Teresa’s College Ernakulam, under my supervision at the Department of Physics, St.Teresa's College, Ernakulam for the partial fulfilment of the award of Degree Of Bachelor of Science in Physics during the academic year 2020-'21 .The work presented in this dissertation has not been submitted for any other degree in this or any other university.

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Date: 09-05-2022

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**ERNAKULAM**



**BSc PHYSICS**

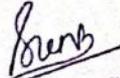
**PROJECT REPORT**

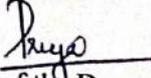
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**Register Number : AB19PHY008**

**Year of work : 2021 - 2022**

This is to certify that this project work entitled ‘ **DIGITAL THERMOMETER USING ARDUINO AND LM35 TEMPERATURE SENSOR** ’ is an authentic work done by LAKSHMI KV.

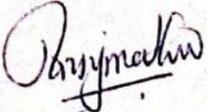
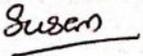
  
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**EXAMINERS:**

## **DECLARATION**

I, **Lakshmi KV (Register Number: AB19PHY008)**, final year B.Sc. Physics student, Department of Physics, St.Teresa's College, Ernakulam do hereby declare that the project work entitled “ **DIGITAL THERMOMETER USING ARDUINO AND LM35 TEMPERATURE SENSOR**“ has been originally carried out under the guidance and supervision of Dr. Sunsu Kurian, Assistant Professor, Department of Physics, St.Teresa's College (Autonomous), Ernakulam in partial fulfilment for the award of the Degree of Bachelor of Physics. I further declare that this project is not partially or wholly submitted for any other purpose and the data included in the project is collected from various sources and are true to the best of my knowledge.

PLACE: Ernakulam

DATE: 09-05-2022

## **ACKNOWLEDGMENT**

I am bringing out this project report with immense pleasure and sense of satisfaction. I feel obliged to acknowledge the support and guidance that came from various quarters during the course of completion of this project. I would like to express our sincere gratitude to Dr. Sunsu Kurian, the project in charge, for guiding me throughout the entire duration of the project work. This work would not have succeeded without her support and motivation.

I would also like to extend our sincere thanks to all the faculty members of the Physics Department for their valuable suggestions and corrections. I would also like to thank all our friends for being with us whenever we were in need. Above all, I owe my heartfelt gratitude to the Almighty for showers abundant blessings upon me to get through this project.

# **ABSTRACT**

The main objective of the project is to develop a digital thermometer and measure its accuracy. The project is designed by using an Arduino UNO Board, LM35 temperature sensor, LED display, potentiometer, connecting wires and breadboard. The sensor LM35 is a temperature sensor that outputs an analog signal which is proportional to the instantaneous temperature. The output voltage can easily be interpreted to obtain a temperature reading in Celsius. Due to its small size the temperature sensor can be used in a wide variety of applications.

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# CHAPTER 1

## INTRODUCTION

Temperature measurement in today's industrial environment encompasses a wide variety of needs and applications. Temperature is a very critical and widely measured variable for most mechanical engineers. To a medical practitioner's temperature is a fundamental quantity that must be measured in order to attain a healthy life in the world of medicine but in the world of engineering temperature is either conserved for the purpose of effective work or release not to damage the job. The need to measure and quantify the temperature of something started around 150 AD when Galen determined the 'complexion of someone based on four observable quantities. The actual science of 'thermometry' did not evolve until the growth of the sciences in the 1500's the first actual thermometer was an air-thermoscope described in Natural Magic (1558, 1589), which all led to the development of thermometer. The first calibrated thermometer was the liquid in glass thermometer which was later divided into mercury in glass thermometer and alcohol in glass thermometer. During the invention of this thermometer some facts were not in place which led to their disadvantages and with the aid of technological advancement digital thermometer came into existence. Microcontroller based temperature measurement in today's environment encompasses a wide variety of needs and applications. To meet this wide array of needs the process controls industry has developed a large number of sensors and devices to handle this demand. In this project we will be using LM35 temperature sensors thus , will be able to understand the concepts and use of the LM35 sensor all together . In advancement in technology, digital thermometers can be added to home automation utilises, IOT service for medical records, industrial jobs and many more.

## 1.1 LITERATURE REVIEW

Literature review is an assignment of previous tasks done by some authors and collection of information or data from research papers published in journals to progress our task. It is a way through which we can find new ideas, concept. There is a lot of literature published before on the same task; some papers are taken into consideration from which idea of the project is taken. <sup>[1]</sup>.

Microcontroller can be regarded as a single-chip special-purpose computer dedicated to executing a specific application. As in general purpose computers, a microcontroller consists of memory (RAM, ROM, and Flash), I/O peripherals, and processor core. However, in a microcontroller, the processor core is not as fast as in a general purpose-computer, the memory size is also smaller. Microcontroller has been widely used in embedded systems such as, home appliances, vehicles, and toys. There are several microcontroller products available in the market, for example, Intel's MCS-51 (8051 family), Microchip PIC, and Atmel's Advanced RISC Architecture (AVR). We mention Atmel ATmega8535 and LM35 temperature sensors in this project.

## CHAPTER 2

### EXISTING SYSTEM OF THERMOMETERS

#### 2.1 Thermometers

A thermometer is a device used to measure the temperature of any particular device or living body and displays the reading. A thermometer scale can be in Fahrenheit or Celsius.

#### 2.11 Conventional thermometers used earlier are

##### 1. Bulb or Mercury Thermometers

These thermometers consist of a sealed glass tube with a bulb-like glass container at the end. It works on the principle that liquids expand on getting heated. However, a disadvantage of these thermometers is that they can measure temperature only up to a certain extent.

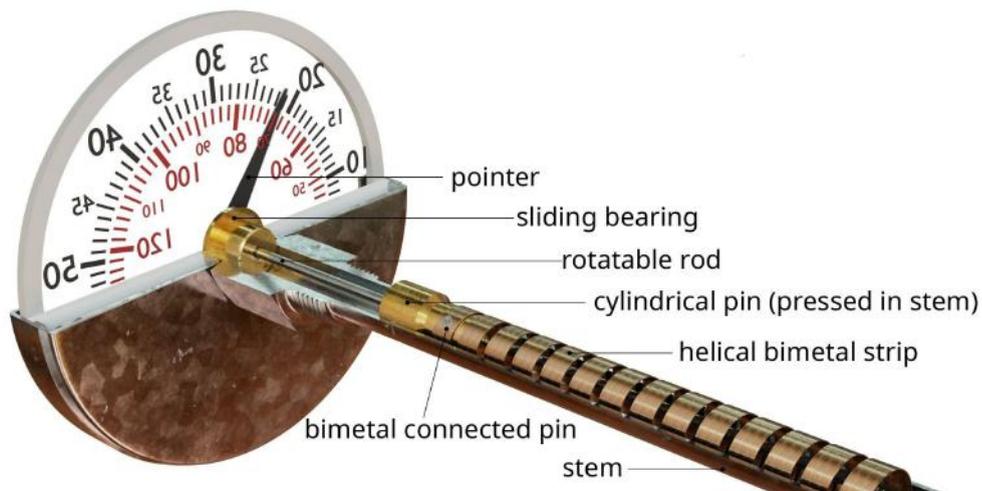


**Fig: 1 :Mercury Thermometer**

##### 2. Bimetallic Thermometers:

These thermometers consist of two metals joined together and as these metals get heated, they get expanded at different rates causing the bending of either of the metals. This bimetallic strip is attached to a dial with a calibrated temperature scale to indicate the

readings. However, these systems are also easily prone to breakage. The calibration is not accurate and can change easily.



**Fig 2: Bimetallic Thermometers**

### 2.12 Digital Thermometer

It consists of a thermistor to sense the temperature and an electronic display of the temperature. Digital thermometers are used orally, rectally, or under the arm. It can read the temperature from 94°F to 105°F.

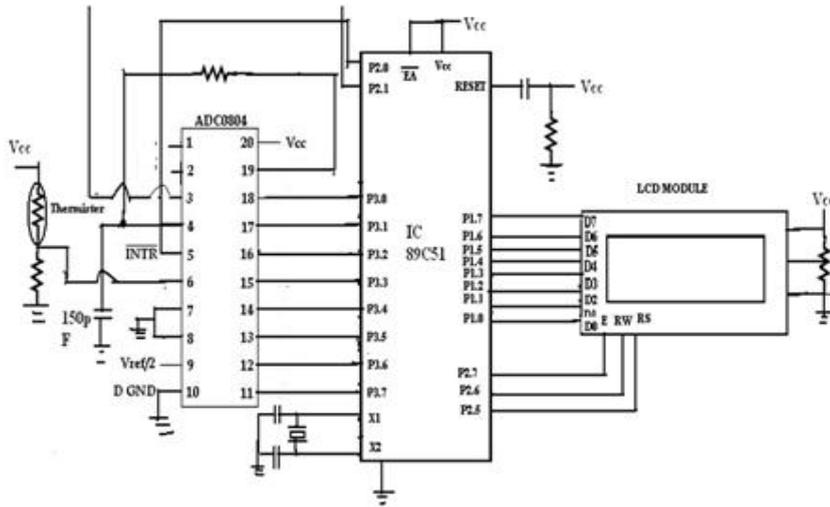


**Fig 3 : Digital Thermometer**

Principle of Working:

The digital thermometer basically consists of a sensor that measures the change in resistance due to heat and converts this change in resistance to temperature. It relies on the principle that

the electrical resistance of metal changes with temperature. All the sensors work by producing a resistance, current or voltage in reaction to a change in temperature. These changes are referred to as analogue output signal.



**Fig 4: Digital Thermometer Circuit**

### 2.12.1 Digital Thermometer components:

1. Battery: It is a button cell LR41 battery made up of metal and provides around 1.5V supply to the thermometer.
2. Body: The body of the thermometer is made up of hard plastic and is 100.5mm long and its width varies from bottom to top, with the bottom being thinner.
3. Thermistor: It is a semiconductor material made up of ceramic and is used to sense the temperature. It is placed at the tip of the thermometer by binding with epoxy and is enclosed inside a cap made up of stainless steel.
4. LCD: It is the display of the thermometer and measures around 15.5mm long and 6.5mm wide. It displays the reading for 3 seconds and then starts flashing indicating the next temperature to be measured.
5. Circuit: It consists of an ADC and a microcontroller along with some passive components.

### **2.12.2 Modern Available Digital Thermometers:**

1. Digital Thermometer ref ECT-1: It measures temperature from 32°C to 42°C with an accuracy of 0.1°C. It is used mainly in medical applications.

2. Digital Thermometer Model Number: EFT-3: It measures temperature from 50°C to 125°C. It is used to measure the temperature of solid and liquid food

3. Thermolab digital thermometer IP65: It measures temperature range from 50 to 200 °C with an accuracy of +/-1°C.

### **2.2 Advantages of Digital Thermometers:**

- Accuracy: The temperature reading doesn't depend on scale reading and instead shown directly on the display. Hence temperature can be read exactly and accurately.
- Speed: Digital thermometers can reach a final temperature in 5 to 10 seconds compared to conventional thermometers.
- Safety: Digital thermometers don't use mercury, hence the hazards of mercury are eliminated in case the thermometer breaks.
- Strong: The thermometer doesn't need to be shaken for the proper mercury level, hence the risk of the tube getting broken is eliminated.

### **2.3 Applications of Digital Thermometer:**

- Medical Applications: The digital thermometers are used to measure human body temperature around 37°C. These thermometers are mostly probe type or ear type. It measures oral, rectal, and armpit body temperature.
- Marine Applications: Digital thermometers with a high-temperature exhaust gas sensor as the temperature sensor can be used in marine applications for measuring the local temperature.
- Industrial Applications: Digital thermometers are also used in power plants, nuclear power plants, blast furnaces, shipbuilding industries, etc. They can measure temperature from -220°C to +850°C

# **CHAPTER 3**

## **PROPOSED SYSTEM**

The proposed system is to design a Digital Thermometer using Arduino and LM35 Temperature Sensor that is more accurate, precise, cost effective and efficient compared to the existing system. In the proposed system, digital temperature sensor with Arduino Uno is used to control the whole process. Temperature measurement in today's industrial environment encompasses a wide variety of needs and applications. Industry has developed a large number of sensors and devices to handle this demand. An LM35 temperature sensor is used for sensing environment temperature which gives 1 degree temperature on every 10mV change at its output pin. The measured temperature will be directly displayed on a 16\*2 LCD. Here LM35 is capable of reading the temperature in Centigrade scale. The output voltage of the sensor is directly proportional to temperature in Centigrade scale. Also there is no need of physical contact to measure temperature. The work is accomplished by proper mounting of the circuit and execution.

### **3.1 Advantages of the system**

The LM35 series are precision integrated-circuit temperature devices that have an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 sensor has low-output impedance and precise inherent calibration which makes interfacing to readout or control circuitry especially easy. The device is used with single power supplies, or with plus and minus supplies and most suitable for remote applications. It is easily applied in the same way as other integrated-circuit temperature sensors. Glue or cement the device to a surface and the temperature should be within about 0.01°C of the surface temperature. Typically operates from 4 to 30 volts and draws only 60 µA from the supply, and has a very low self-heating of less than 0.1°C in still air. We can monitor temperature or can make a power cut off when heat exceeds above limits using this digital thermometer and can be used in multiple ways. The small size of the sensor makes it useful for a wide range of application. The LM35 is a very popular sensor hence its very easy to use and has varied

applications. It does not need any additional circuit to be used. It is powered directly from a 5V source and delivers an analog output between 0V to 1.5V. This analog voltage can be read by the ADC from a microcontroller like PIC or Arduino, Can be used to measure skin temperature and also to measure liquids temperature but covering the pins with water proof materials, can be used in transportation vehicles to determine the icing conditions of the road. Based on the readings of the thermometer, the air conditioning systems, heating and cooling systems can be controlled either manually or automatically. Sensor is small so it can be used in a wide variety of applications *viz* thermometers, thermostats, monitoring systems, home automation utilises, IOT service for medical records, industrial jobs also in restaurants and schools.<sup>[2]</sup>

### **3.2 ADVANTAGES AND ECONOMIC IMPORTANCE OF DIGITAL THERMOMETER:**

- Digital thermometer can accurately take, decide and measure temperature with the aid of a temperature sensor and digital display.
- Digital thermometer is easier to read compare to glass thermometer
- Digital thermometers are fast, accurate and convenient for use.
- In digital thermometers using Arduino UNO and LM35 the temperature is calculated by converting it from volt to Celcius , making it more accurate.
- Digital thermometer has a wide range of applications, it is usually applied to measure gas, liquid and solid temperature. In numerous fields, it can be applied in several areas such as the Hospital, restaurant and schools.

## CHAPTER 4

### OVERVIEW OF COMPONENTS

The following table shows the hardware and software components required to design the room model of the proposed system of digital thermometer.

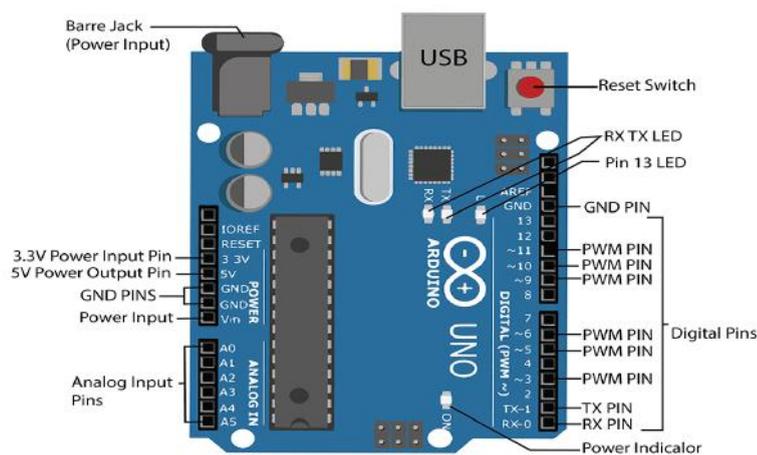
<b>Hardware components</b>	<b>Software components</b>
<ul style="list-style-type: none"><li>● Arduino UNO R3 Development Board</li><li>● LM35 Analog Temperature Sensor</li><li>● LCD Display</li><li>● 10k Potentiometer</li><li>● 2 Breadboards</li><li>● Connecting wires</li><li>● Personal computer or laptop</li></ul>	<ul style="list-style-type: none"><li>● Arduino IDE(Integrated Development Environment)for arduino board programming version-1.8.14.0</li></ul>

**Table 1.0 : Hardware and software components**

## 4.1 Hardware specifications

These are the hardware components used to implement the proposed system of Digital thermometer :-

### 4.1.1 ARDUINO UNO R3



**Fig 4.1 Arduino Board**

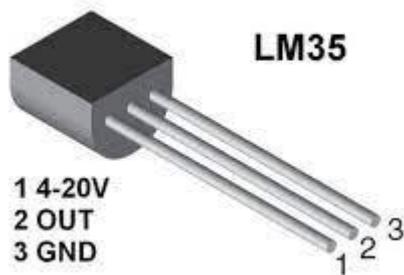
Arduino UNO is a largely and most widely used microcontroller based on ATMEGA328P, which was developed by Arduino.cc. The board has both the set of digital and analog input/output pins. The board contains 14 digital pins and 6 analog pins. It is programmable with Arduino IDE(Integrated development environment)based on the programming languages,C and C++. It can be powered by the USB cable or by an external battery. The main advantage of using arduino UNO is that you can directly load the programs into the device without the need of a hardware programmer to burn the program.<sup>[3]</sup>

#### **Features Of Arduino Uno Board Microcontroller ATmega328.**

- Operating Voltage 5V
- Input Voltage (recommended) 7-12V Input Voltage (limits) 6-20V
- Digital I/O Pins 14 (of which 6 provide PW output)
- Analog Input Pins6 DC Current per I/O Pin 40 mA
- DC Current for 3.3V Pin 50 mA

- Flash Memory 32 KB (ATmega328) of which 05
- KB used by bootloader SRAM 2 KB (ATmega328)
- EEPROM 1 KB (ATmega328) Clock Speed 16 MHz

## 4.12 LM35 TEMPERATURE SENSOR



**Fig 4.2 LM35 temperature sensor**

LM35 sensor is a temperature measuring device having an analog output voltage proportional to the temperature. It provides output voltage in Centigrade (Celsius). It does not require any external calibration circuitry. The sensitivity of LM35 is 10 mV/degree Celsius.<sup>[5]</sup> As temperature increases, output voltage also increases. It is a 3-terminal sensor used to measure surrounding temperature ranging from -55 °C to 150 °C. LM35 gives temperature output which is more precise than thermistor output

### **FEATURES:**

- Calibrated Directly in Celsius (Centigrade)
- Linear + 10-mV/°C Scale Factor
- 0.5°C Ensured Accuracy (at 25°C)
- Low Self-Heating, 0.08°C in Still Air
- Non-linearity Only  $\pm 1/4^\circ\text{C}$  Typical
- Low-Impedance Output, 0.1  $\Omega$  for 1-mA

- Rated for Full  $-55^{\circ}\text{C}$  to  $150^{\circ}\text{C}$  Range
- Suitable for Remote Applications
- Low-Cost Due to Wafer-Level Trimming
- load
- Less than  $60\text{-}\mu\text{A}$  Current Drain
- Operates from  $4\text{ V}$  to  $30\text{ V}$

### **WORKING:**

LM35 output voltage is proportional to centigrade/Celsius temperature. LM35 Celsius/centigrade resolution is  $10\text{mV}$ .  $10\text{mV}$  represents one degree centigrade/Celsius. So if LM35 outputs  $100\text{mV}$  the equivalent temperature in centigrade/Celsius will be  $100/10 = 10$  centigrade/Celsius. LM35 can measure from  $-50$  degree centigrade/Celsius up to  $150$  degree centigrade/Celsius.

Arduino analog pin is used to read the analog output signals from the sensor. The circuit diagram of the project is given below. To Pin#1 of LM35 apply  $5\text{V}$ , make Pin#2 ground, and the third one the middle pin is the output pin. It gives a voltage signal that is actually the temperature of the particular place.

**Note:** LM35 is an absolute temperature sensor. It can only measure the temperature of the surroundings within the circle of between  $100$  to  $500$  feet . So if you are using the internet and you are matching your temperature reading from the one that is given for your city on a weather forecast site then your reading will not be the same as theirs. It will be near but not the same.

### **LM35 TEMPERATURE SENSOR VOLTAGE TO TEMPERATURE CONVERSION**

Now one of the most difficult thing is how to convert the voltage generated/output by the LM35 at output in Celsius or Fahrenheit scales. Well this needs you to first go through the data sheet of the temperature sensor and know about the characteristics of the sensor.

LM35 Output temperature in Celsius form. It Increments the output by  $1$  on every  $10\text{ mV}$  change in temperature.

- when the sensor outputs  $500\text{ mv}$  voltage, the temperature in Celsius is  $50$  degree Centigrade.

- For 400 mV output temperature in Celsius is 40 degree centigrade.
- For 600 mV the temperature is 60 degree Celsius.

### 4.13 LCD DISPLAY

16×2 LCD is a basic 16 character by 2 line display Yellow/Green Backlight. Utilises the extremely most common HD44780 parallel interface chipset (datasheet). Even more, it has JHD162A Compatible Pinout Diagram, and Command Interface code is freely available. Finally, You will need 7 general I/O pins (If used in 4-bit Mode) to interface to this LCD screen. It also includes an LED back-light



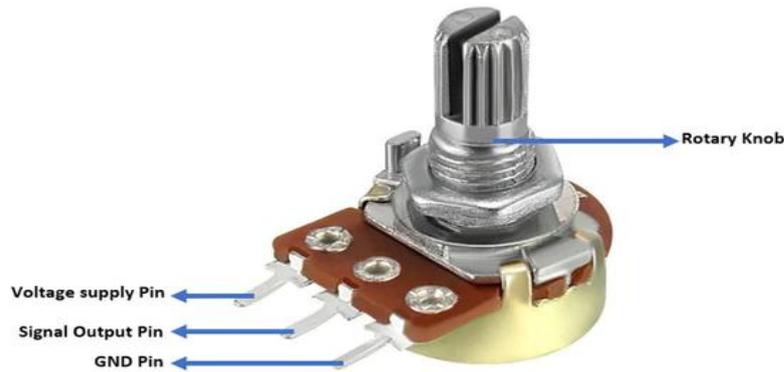
**Fig 4.3 LCD display.**

#### **Features of 16×2 Display LCD:**

- Commonly Used in Student Project, College, copiers, fax machines, laser printers, industrial test equipment, networking equipment such as routers and storage devices
- LCD display module with Green/Yellow Backlight
- SIZE: 16×2 (2 Rows and 16 Characters per Row)
- Can display 2-lines X 16-characters
- Operate with 5V DC
- Wide viewing angle and high contrast

- Built-in industry standard HD44780 equivalent LCD controller

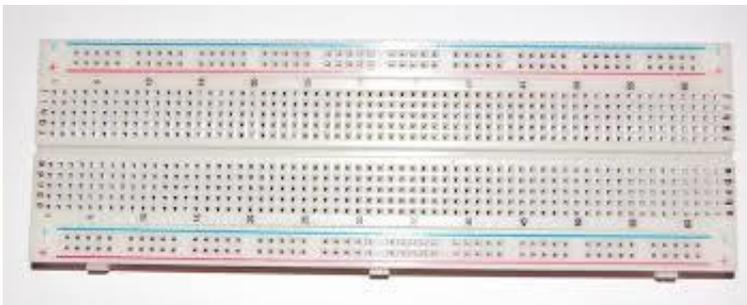
#### 4.14 10K POTENTIOMETER



**Fig 4.4 10K Potentiometer**

These potentiometers are also commonly called a rotary potentiometer or just POT in short. These three-terminal devices can be used to vary the resistance between 0 to 10k ohms by simply rotating the knob.

#### 4.15 BREADBOARD



**Fig 4.5 Breadboard**

A Breadboard is a construction base for prototyping of electronics. The word referred to a literal breadboard , a polished piece of wood used for slicing bread. Later solderless breadboards became available which means it is reusable and this reason makes it popular among students for many projects. The bread board consists of clips which are called tie or contact points, the clips will be maintaining a gap of 2.54mm between each one of them. They are connected from one pin to another using metal strips.

## 4.2 Software specifications

The software needed to implement digital thermometer using an Arduino and LM35 temperature sensor is Arduino IDE , or Integrated Development Environment ,version-1.8.14.0.The software is downloaded and installed on the PC or laptop. This is an open source software that makes it easy to write code to Arduino Uno.<sup>[6]</sup> The programs written in this IDE are called sketches. The software can easily be downloaded from the official website ,[www.arduino.cc](http://www.arduino.cc). The software of the Arduino is well-suited with all kinds of in operation systems like Linux, Windows, and Macintosh, etc.Some of the basic functions of Arduino technology are,

- void setup()-It is technically a function that you create at the top of each program. Inside the curly brackets is the code that you want to run one time as soon as the program starts running.
- Void loop()-This is where the bulk of the Arduino sketch is executed
- digitalRead()- It reads the digital value of the given pin.
- digitalWrite()-It is used to write the digital value to the given pin.
- analogRead()-It reads the analog pin and returns the value.
- analogWrite()-It is used to write the analog value to the given pin.
- pinMode()- It is used to set the pin to I/O mode.

- `Serial.begin(9600)`- It is used to set the beginning of serial communication by setting the rate of bit.
- `Serial.println()`-It is used to print any message, any value of a variable or the values returned by the functions on the serial monitor, which is a screen that displays such information for the user.<sup>[6,8]</sup>

Given below are the steps to upload a sketch to the arduino board:-

Step 1:Enter the code in the arduino IDE.

Step 2:Compile the program and correct the syntax errors.

Step 3:Connect the Arduino using the USB cable.

Step 4:Select the port.

Step 5: Choose the upload option to upload the sketch to the arduino UNO.



**Fig 4.6:Arduino IDE software**

# CHAPTER 5

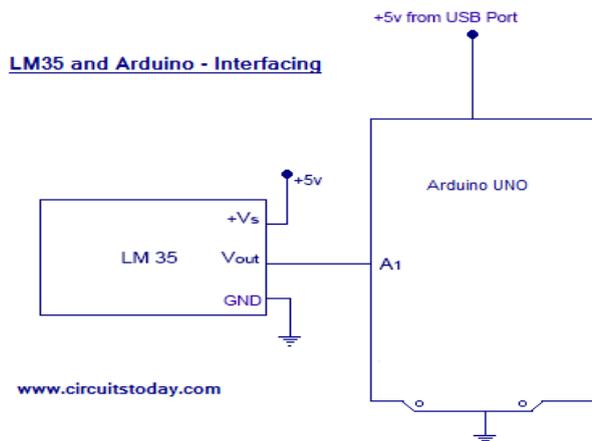
## METHODOLOGY

### 5.1 CONSTRUCTION

Digital thermometer using an arduino uno board and LM35 temperature sensor is constructed in the following steps:

#### 1. Interfacing of LM35 with arduino UNO

Output of the temperature sensor LM35 is given to the analog channel of the A1 of Arduino UNO for sensing real time temperature.



**Fig 5.1 LM35 and Arduino interfacing**

#### 2. Interfacing arduino with LCD

Interfacing of Arduino with LCD is as shown in figure 5.2. Circuit diagram for Arduino based digital thermometer is shown in the figure. Here the 16x2 LCD unit is directly connected to Arduino in 4-bit mode. Data pins of LCD, namely RS, EN, D4, D5, D6, D7 are connected to Arduino digital pin number 7, 6, 5, 4, 3, 2. A temperature sensor LM35 is also connected to Analog pin A0 of Arduino, which generates 1 degree Celsius temperature on every 10mV output change at its output pin.<sup>[7]</sup>



- Connect LCD PIN 5(RW) to Ground.
- Connect LCD PIN 6(E) to PIN 11 of the Arduino.
- Attach the LM35 to the Bread Board.
- Take the output of the LM35 i.e. PIN 2 of the LM35 and connect it to the Analog Input Ao of the Arduino.
- The Rest of the Connections made are to connect the Two Breadboards together.

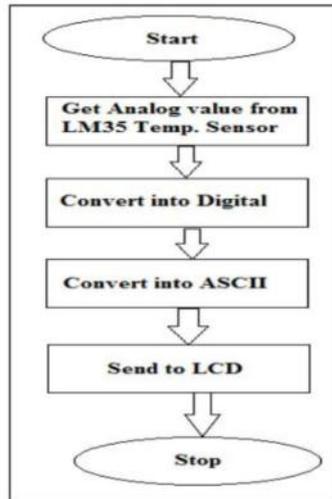
### **5.3 LM35 VOLTAGE CONVERSION TO TEMPERATURE FORMULA / EQUATION DERIVATION FOR ARDUINO**

LM35 Celsius/centigrade resolution is 10Mv

- Arduino analog pins can measure up-to +5 volts OR the voltage on which it is working normally +5 volts.
- The Arduino analog pin resolution is 1023 starting from 0. On +5 volts input it counts to 1023.
- LM35 max voltage output is 1500mV( At 150 degree centigrade). 1500mV is equal to  $1500/1000 = 1.5$  volts. So LM35 at max outputs 1.5 volts.
- Arduino analog pin count for 1.5 volts equals to  $(1.5 / 5)*1023 = 307.5$  . At +5 volts it's 1023 and at 1.5 volts it's 307.5.
- New Arduino-LM35 Resolution =  $307.5 / 150 = 2.048$  . Now if the arduino analog pin counts 2.048 it is equal to 1 degree change in centigrade/Celsius temperature of LM35.

### **5.4 CODING**

The code for Temperature Measurement using LM35 is simple. First we include a library for the LCD unit and then we define data and control pins for the LCD and temperature sensor. After getting analog value at an analog pin we read that value using the analog read function and store that value in a variable. And then convert the value into temperature by applying the below given formula.



**Fig 5.4 Software algorithm of arduino uno microcontroller**

The temperature condition at any instant as sensed by the LM35 is displayed on a Liquid Crystal Display (LCD). To do this the Arduino UNO is programmed to copy the output. of the ADC (which is inbuilt ADC) and convert the result to ASCII then transfer to the LCD to be displayed. The flow chart in the figure shows the software algorithm of the Arduino UNO microcontroller.

The code that we used is given below:

```

sketch_apr04b | Arduino 1.8.20 Hourly Build 2021/12/20 07:33
File Edit Sketch Tools Help

sketch_apr04b
#include<LiquidCrystal.h>
LiquidCrystal lcd(12,11,5,4,3,2);
const int Sensor = A0;
int adc=0;
float voltage=0;
byte degree_symbol[8] =
{
  0b00111,
  0b00101,
  0b00111,
  0b00000,
  0b00000,
  0b00000,
  0b00000,
  0b00000
};
void setup()
{
  pinMode(Sensor, INPUT);
  lcd.begin(16,2);
  lcd.setCursor(1, degree_symbol);
  lcd.print(" Digital ");
  lcd.setCursor(0,1);
  lcd.print(" Thermometer ");
  delay(4000);
  lcd.clear();
  Serial.begin(9600);
}
void loop()
{
  float temp_reading=analogRead(Sensor);
  float temperature=temp_reading*(5.0/1023.0)*100;
  delay(10);
}
  
```

**Fig 5.5 Programme Code (a)**

```
sketch_apr04b | Arduino 1.8.20 Hourly Build 2021/12/20 07:33
File Edit Sketch Tools Help
sketch_apr04b
}
void setup()
{
  pinMode(Sensor, INPUT);
  lcd.begin(16, 2);
  lcd.createChar(1, degree_symbol);
  lcd.setCursor(0, 0);
  lcd.print(" Digital ");
  lcd.setCursor(0, 1);
  lcd.print(" Thermometer ");
  delay(4000);
  lcd.clear();
  Serial.begin(9600);
}
void loop()
{
  float temp_reading=analogRead(Sensor);
  float temperature=temp_reading*(5.0/1023.0)*100;
  delay(10);
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("Temperature in C");
  lcd.setCursor(4,1);
  lcd.print(temperature);
  lcd.write(1);
  lcd.print("C");
  delay(2000);
  analogRead(A0);
  Serial.println("ADC value");
  Serial.println(adc);
  voltage=adc*0.0048828;
  Serial.println("Input voltage signal at A0 Channel");
  Serial.println(voltage);
  delay(2000);
}
```

**Fig 5.6 Programme Code (b)**

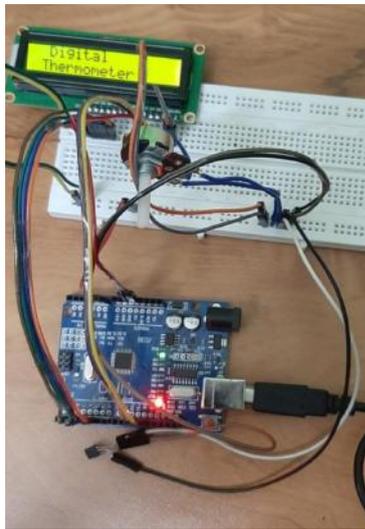
## 5.5 WORKING

A high precision digital thermometer is designed in this project. It is constructed with simple components like Arduino, LM35 temperature sensor and an LCD display. The working of the circuit is very simple and is explained below.

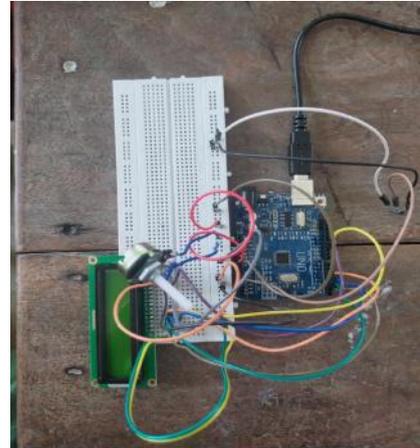
Once the connections are completed and the coding is done, the USB pin of the arduino UNO is connected to a computer. The temperature sensor i.e. LM35 continuously monitors the room temperature and gives an analogue equivalent voltage which is directly proportional to the temperature.

This analogue data is given to Arduino through A0. As per the code written, the Arduino converts this analogue voltage value to digital temperature readings. This value is displayed on the LCD. Our Arduino Uno has an in-built 10 bit ADC (6 channel). We can make use of this inbuilt ADC of arduino to convert the analog output of LM35 (or other device/sensor) to digital output. As Arduino Uno has a 6 channel inbuilt ADC, there are 6 analog input pins numbered from A0 to A5. You can connect an analog output of LM35 to any of these analog input pins of an arduino but we are using A0 for now.

The rate of change of temperature capture can be programmed in the code. The output displayed on the LCD is an accurate reading of temperature in centigrade.<sup>[8]</sup>



**Fig 5.7 Experimental Setup**



**Fig 5.8 Experimental Setup**

### 5.6 OBSERVATION

If we need to measure the temperature of a specific object, for example if we need to measure the temperature of the soldering iron, we have to place it on the tip of the LM35 temperature sensor, now we will be able to see the increase in temperature on the LCD screen. Similarly, if we remove the soldering iron from the tip of the LM35 temperature sensor, we will be able to observe the decrease in temperature on the LCD screen.

Actual Temperature	Temperature using the constructed Digital Thermometer	Difference	Percentage Error
36.9	36.1	0.8	2.17%
35.4	34.2	1.2	3.39%
37.7	36.6	1.1	2.92%

39.2	38.3	0.9	2.29%
37	35.2	1.8	4.86%
37.6	36.3	1.3	3.45%

**Table 5.1 Observation**

The experimental observation shows the difference between constructed digital thermometer and the actual temperature. Also the percentage error of corresponding temperatures also identified.

**SUBSTITUTION:**

Difference = Actual temperature- temperature measured using the constructed digital

$$\text{Thermometer} = 36.9 - 36.1 = 0.8$$

Percentage Error = (Difference/ Actual Temperature)\*100

$$= (0.8/36.9) * 100 = 2.17$$

Average Percentage Error = (2.17+3.39+2.92+2.29+4.86+3.45)/6

$$= 3.18\%$$

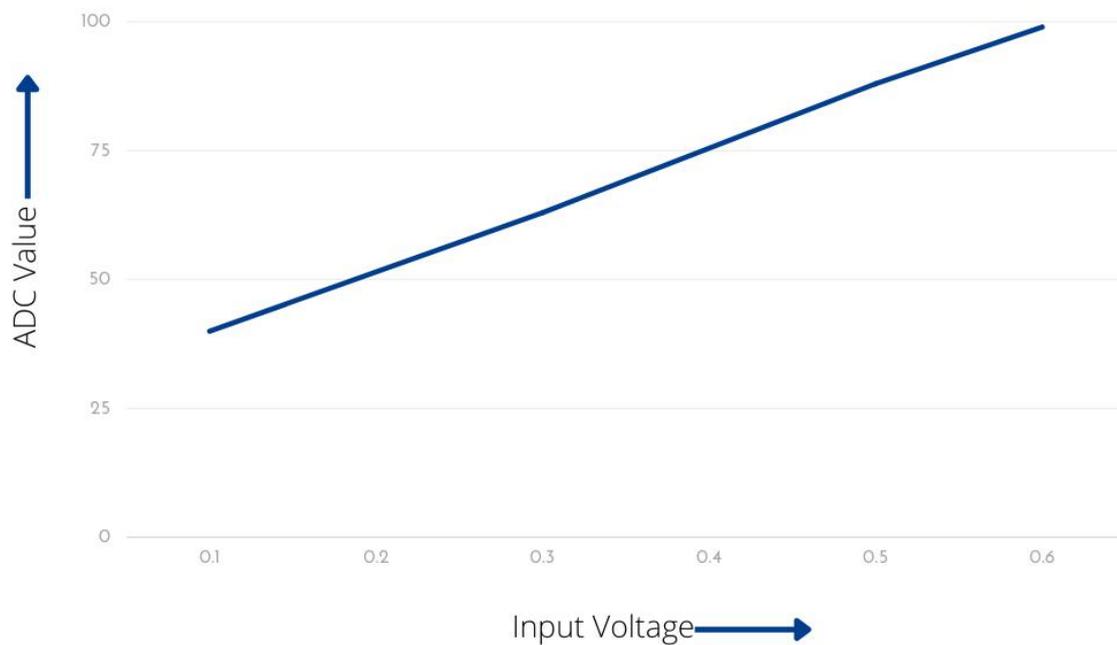
**ADC Values**

ADC Value	Input Voltage
40	0.1955
63	0.3079
88	0.4301
155	0.7576
99	0.4839
177	0.8651

**Table 5.2 ADC value and Input Voltage**

## ADC vs VOLTAGE

The given graph plotted contains ADC value in Y axis Input voltage in X axis. An analogue to digital converter takes a snapshot of an analogue voltage at one instant in time and produces a digital output code which represents this analogue voltage.



## **5.7 EXPERIMENTAL RESULT**

Practical test has been conducted to evaluate the real time performance of the constructed temperature sensor. The temperature using the constructed digital thermometer is noted. And the difference between actual temperature and using the constructed Digital thermometer is identified. The percentage error is calculated and the average percentage error is found out.

Average Percentage Error = 3.18%

## **5.8 FUTURE SCOPE OF PROPOSED SYSTEM**

Thermometers are used in industries, weather studies, medicinal fields and scientific research. Measuring temperature is an important part of many applications. Maintaining precise temperatures in storage rooms, laboratories, incubators, etc. is of high priority.. Now a days, the use of digital thermometers is increasing as they are accurate and safe to use. Digital thermometers can furthermore be advanced into home automations, use in cold rooms, food temperature reserve and so on. Due to its accuracy, preciseness and low cost the proposed system can be used in many applications.

## **CONCLUSION**

From the experimental results we can conclude that the proposed system is highly accurate and nullifies the effect of external parameters. Digital thermometer is a less hazardous instrument used for taking/recording temperature from a specific body. It works just like a liquid or glass thermometer but in a different way because of its accuracy in reading. LM35 sensor is a very handy component for making projects. The low price and accuracy reading make it popular in making projects. With the aid of advancing technology in the past few years, Digital thermometers will be more advanced enough to end the error due to parallax reading in liquid in glass thermometers and also comfort the easy access and accurate reading of temperature. Digital thermometers can furthermore be advanced into home automations, use in cold rooms, food temperature reserve and so on.

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Project Report

On

**A STUDY ON THE ACCEPTANCE OF  
COVID-19 VACCINE**

*Submitted*

*in partial fulfilment of the requirements for the degree of*

**BACHELOR OF SCIENCE**

*in*

**MATHEMATICS**

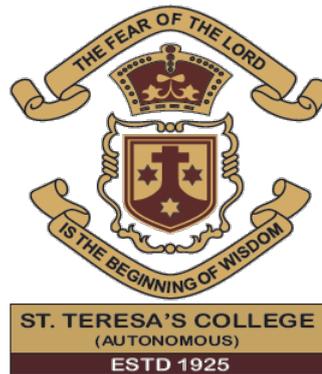
*by*

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**(Register No. AB19AMAT056)**

*Under the Supervision of*

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**APRIL 2022**

ST. TERESA'S COLLEGE (AUTONOMOUS), ERNAKULAM

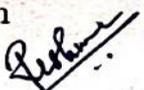


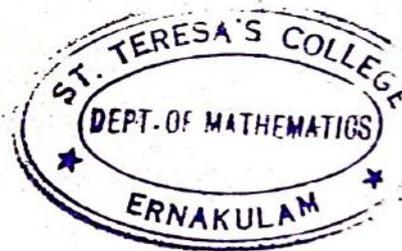
**CERTIFICATE**

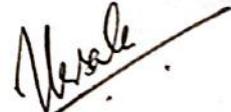
This is to certify that the dissertation entitled, **A STUDY ON THE ACCEPTANCE OF COVID-19 VACCINE** is a bonafide record of the work done by Ms. **LAKSHMI PRIYA S** under my guidance as partial fulfillment of the award of the degree of **Bachelor of Science in Mathematics** at St. Teresa's College (Autonomous), Ernakulam affiliated to Mahatma Gandhi University, Kottayam. No part of this work has been submitted for any other degree elsewhere.

Date: 7/03/2022

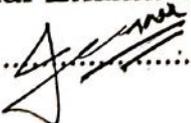
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2: .....

# DECLARATION

I hereby declare that the work presented in this project is based on the original work done by me under the guidance of Dr.Elizabeth Reshma M T, Assistant Professor, Department of Mathematics, St. Teresa's College(Autonomous), Ernakulam and has not been included in any other project submitted previously for the award of any degree.

Ernakulam.

Date: 7/03/2022



LAKSHMI PRIYA S

AB19AMAT056

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Ernakulam.  
Date:7/03/2022

LAKSHMI PRIYA S  
**AB19AMAT056**

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# Chapter 1

## INTRODUCTION

---

Coronavirus disease (COVID-19 ) is an infectious disease caused by the SARS-CoV-2 Virus.

The majority of people who are injected with the virus will get mild to severe respiratory infection and recover without the need for additional treatment. Some, on the other hand, will become critically unwell and require medical assistance. People who are older and those who are disabled with underlying medical issues such as heart disease, diabetes, and cancer, people who have asthma or chronic obstructive pulmonary disease are more likely to acquire serious illness. COVID-19 can make you sick and cause you to get extremely ill or die at any age.

The release of the COVID-19 vaccine represents a significant step toward slowing the pandemic's spread and reducing sickness and deaths. On January 16, 2021, India began administering COVID-19 vaccines. As of December 31, India has administered around 1.44 billion doses in total as of December 2021, including first and second doses of presently available vaccines In India, 90% of the eligible population received atleast one dose, and 64 percent were fully immunised.

India reported the first confirmed case of COVID-19 infection on 30th January 2020 in the state of Kerala. The affected had a travel history that began in Wuhan, China.

We have gone through various survey reports with objectives similar to our

project. Some of those survey results are given below. In a survey on the topic "Acceptance and concerns regarding the COVID-19 vaccine in Kerala", they received 314 participants, of which 84% were willing to take vaccination or were already vaccinated, and 16% were unwilling to take vaccination. The major reasons for the hesitancy reported by those unwilling to take the vaccine were anxiety about adverse reactions and concern regarding the efficacy of the vaccine. Another survey on the topic "COVID-19 vaccine acceptance: beliefs and barriers associated with vaccination among the general population in India" had 351 participants, among whom 64.4% were concerned about COVID-19 vaccine side effects, while 20.2% of the respondents lacked confidence in the effectiveness of the vaccination. 72.9% responded that they would get vaccinated if the effectiveness and safety of the COVID-19 vaccine were confirmed using further studies. The state government survey on COVID-19 vaccine hesitancy in Tamil Nadu has found that the elderly population in Tamil Nadu was the most hesitant compared to other age groups. The reasons for the hesitancy from this survey were fear of injections, fear of complications, and confidence that they would not get COVID-19.

## 1.1 BACKGROUND OF THE STUDY

There is a need to understand the level of acceptance and hesitancy towards the COVID-19 Vaccine in the population. The study was carried out to estimate the level of vaccine acceptance and hesitancy among the people in Ernakulam district. Study also aims to understand the factors that can improve vaccination. This may help to design appropriate behavior change communication campaigns to improve the acceptance of COVID-19 Vaccine.

## 1.2 OBJECTIVE

- To study the acceptance of COVID-19 Vaccine.
- To study whether there is any relation between people's education and acceptance of COVID-19 Vaccine.
- To study whether there is any relation between place of residence and acceptance of COVID-19 Vaccine.
- To Study the reason for the reluctance to take the vaccine.
- To study the factors that can improve the COVID-19 Vaccine acceptance.

## 1.3 SIGNIFICANCE OF STUDY

- Major findings of this study can be used in planning vaccination campaigns.
- The study identifies major concerns regarding efficiency and safety of the covid-19 vaccine.
- The study also identifies the key barrier for vaccine acceptance.
- This can help the decision makers to formulate various strategies that can help to implement covid-19 vaccination successful.

## Chapter 2

# DATA DESCRIPTION

---

### 2.1 DATA SOURCE

There are two types of data collection procedures utilised by researchers: primary and secondary. The questionnaire method is included in the primary level.

Second, we have a way in which we employ already collected data. We've used the primary method for collecting data.

### 2.2 VARIABLES UNDER CONSIDERATION

The study was conducted using an online self administered questionnaire. The questionnaire was circulated using google form through social media platforms. The online questionnaire address several variables including the socio-demographic parameters, believes towards COVID-19 vaccine acceptance, potential barriers that may prevent from being vaccinated and factors that can improve COVID-19 vaccine acceptance. The target population for the survey was individuals above 18 years among the population of Ernakulam district.

## Chapter 3

# METHODOLOGIES

---

### 3.1 EXPLORATORY DATA ANALYSIS

Exploratory data analysis consists of descriptive properties of data. One of the methods used for exploratory data analysis is the graphical method. Here, bar graphs and pie charts are used for analysing the qualitative data.

A bar chart or bar graph is a chart or graph that presents categorical data with rectangular bars with heights or lengths proportional to the values that they represent. The bars can be plotted vertically or horizontally. Bar graphs or charts provide a visual presentation of categorical data. Categorical data is a grouping of data into discrete groups.

A pie chart is a type of graph that represents the data in a circular graph. The slices of pie show the relative size of the data, and it is a type of pictorial representation of data. A pie chart requires a list of both categorical and numerical variables. Each sector denotes a proportionate part of the whole.

## 3.2 CHI SQUARE TEST

The Chi-square test of independence is a statistical hypothesis test used to determine whether two categorical or nominal variables are likely to be related or not.

We can use the test when we have counts of values for two categorical variables. We Can also use the test if we have only a table of values that shows frequency counts. The Chi-square test of independence checks whether two variables are likely to be related or not. We have counts for two categorical or nominal variables. We also have an idea that the two variables are not related. The test gives us a way to decide if our idea is plausible or not.

For the Chi-square test of independence, we need two variables. Our idea is that the variables are not related. The hypothesis for a chi-square test of independence are Null Hypothesis and Alternative Hypothesis. In Null Hypothesis we assume that there is no association between the two categorical variables in the population of interest. And in Alternative Hypothesis we assume that there is association between the two categorical variables in the population of interest. The null and alternative hypotheses are two mutually exclusive statements about a population of interest. A hypothesis test uses sample data to determine whether to reject the null hypothesis.

Null hypothesis ( $H_0$ )

The null hypothesis states that a population parameter (*such as the mean, the standard deviation, and so on*) is equal to a hypothesized value. The null hypothesis is often an initial claim that is based on previous analyses or specialized knowledge.

Alternative Hypothesis ( $H_1$ )

The alternative hypothesis states that a population parameter is smaller, greater, or different than the hypothesized value in the null hypothesis. The alternative hypothesis is what you might believe to be true or hope to prove true.

For chi square test first we have to fix the null hypothesis and alternative hypothesis and Create contingency table of observed frequency and expected frequency. The expected frequency of each cell is equal to the marginal frequency of the row and column that corresponds to a given cell in the observed contingency table divided by total sample size. And find p-value. If p-value is less than the significance level then we reject  $H_0$  and if the p-value greater than significance level then we accept  $H_0$ .

We can calculate the  $\chi^2$  value using the formula,

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

Where,

$O_i$  - Observed value

$E_i$  - Expected value

# Chapter 4

## DATA ANALYSIS

---

### 4.1 SOCIO-DEMOGRAPHIC CHARACTERISTICS

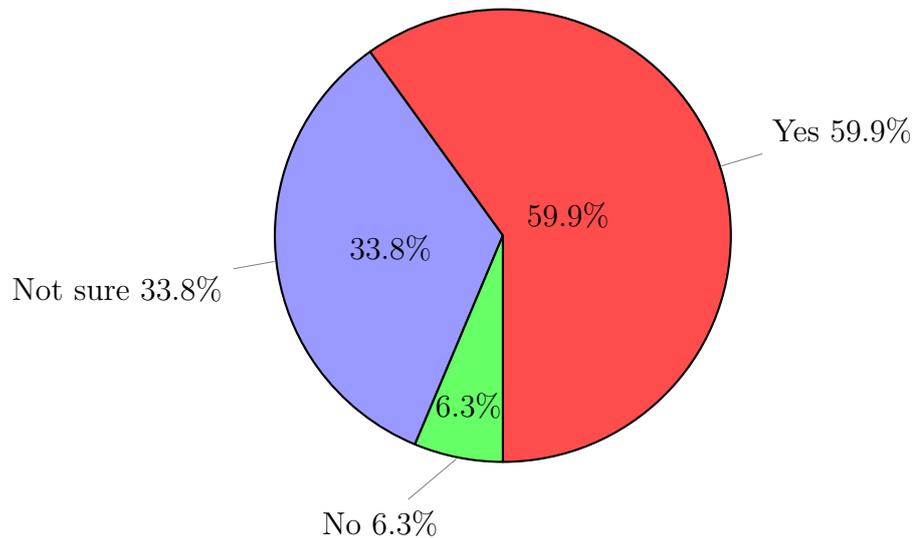
Characteristic	Percentage
<b>Gender</b>	
Male	24.80%
Female	75.20%
<b>Residence</b>	
Urban	56.30%
Rural	43.70%
<b>Education Qualification</b>	
SSLC or less	4.50%
Plus - two	31.30%
Undergraduate	58.10%
Post graduate	5.40%
Others	0.70%
<b>Occupational status</b>	
Student	79.10%
Unemployed	5%
Private job	13.10%
Govt. job	2.90%

Figure 4.1: figure showing the profile of respondents

Total of 444 people participated in the survey. About 75.2% were females and 24.8% were males. Also from the sample, 56.30% was from urban and 43.70% from rural. Among the population 79.1% were students, 5% were unemployed,

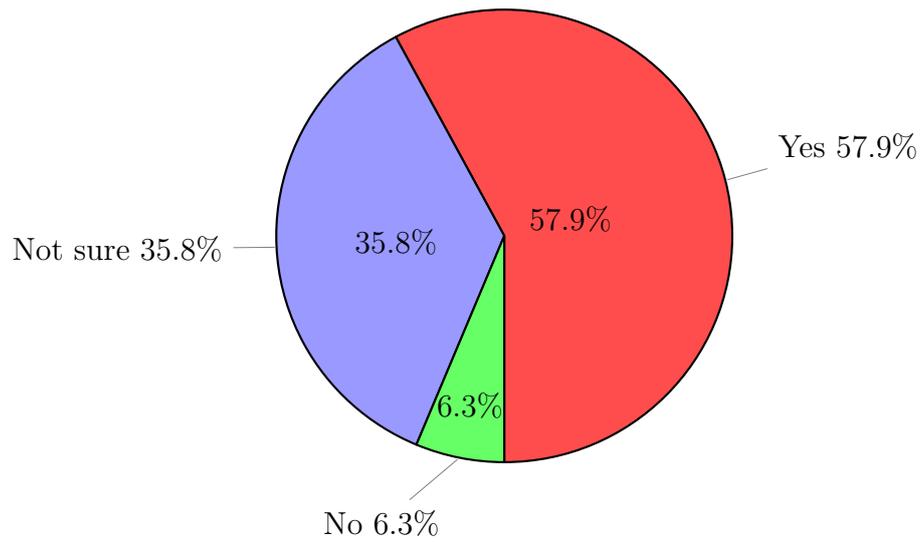
13.1% had private job and 2.8% had government job. From the survey 58.1% were UG/Graduates, 5.2% were SSLC or less, 31.3% plus two (Pre-degree) and 5.4% were Post Graduates

## 4.2 VACCINATION AGAINST COVID-19



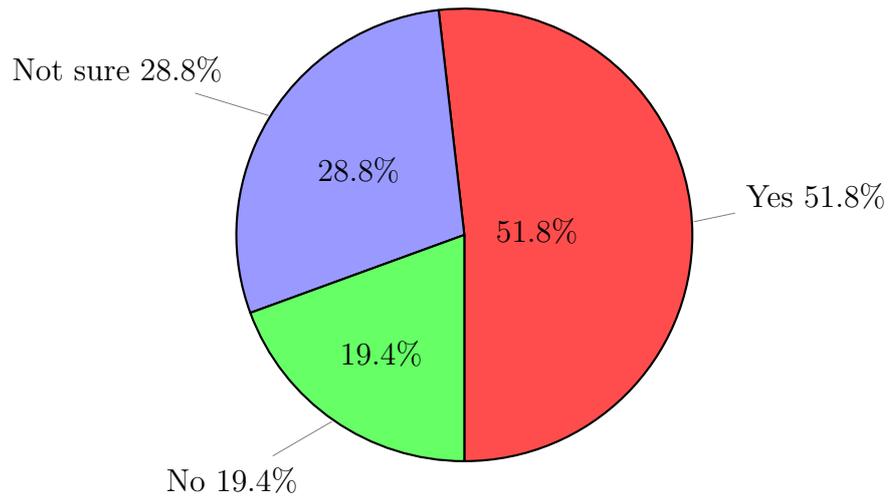
*Pie diagram showing the response of participants regarding their belief on safety towards COVID-19 vaccination*

Among the population, 59.9% believe that the COVID-19 vaccine is safe and 40.1% believe that the COVID-19 vaccine is not safe.



*Pie diagram showing the response of participants regarding their belief on effectiveness towards COVID-19 vaccination*

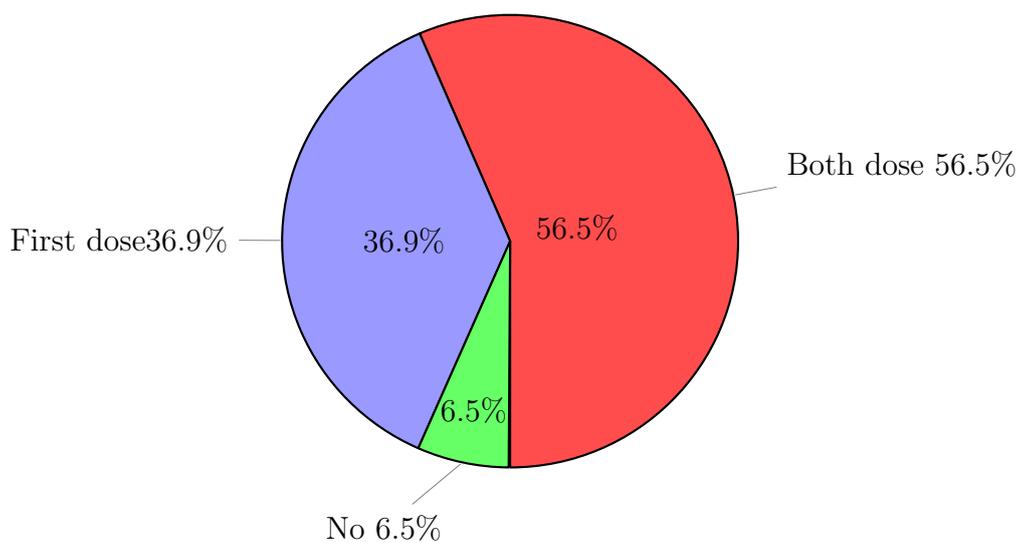
57.9% of people believe that the COVID-19 vaccine is effective, and 42.1% believe that it is not effective.



*Pie diagram showing the response of participants regarding their belief on best method to prevent COVID-19*

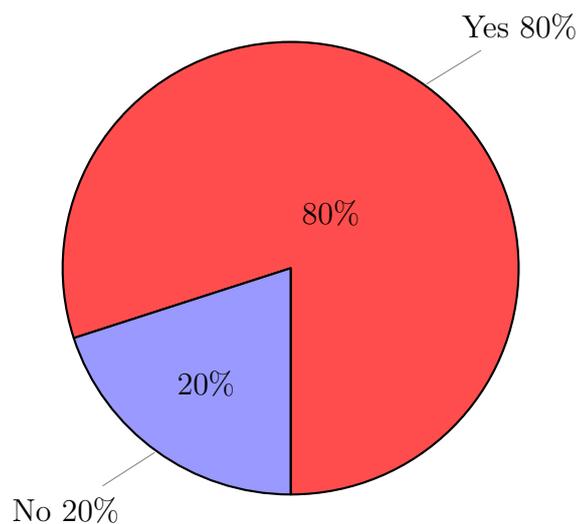
However, 51.8% agreed that immunisation is the most effective strategy to avoid covid 19 problems and 48.2% were against. In conclusion about half of the individual's had good attitude towards covid 19 immunisation.

### 4.3 ACCEPTANCE OF THE COVID-19 VACCINE



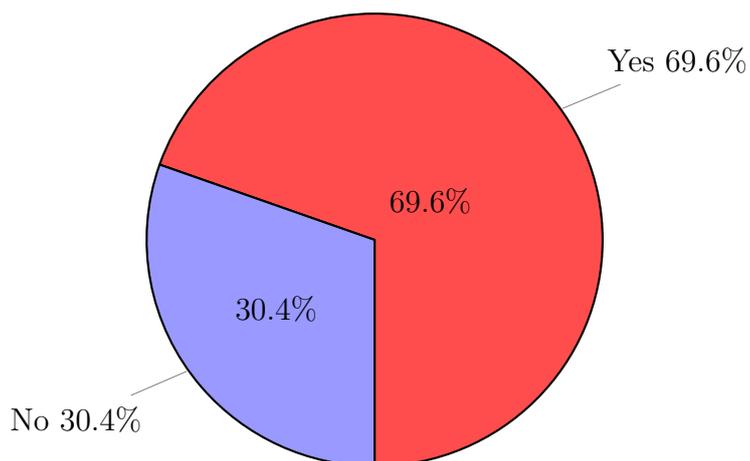
*Pie diagram showing the response of participants regarding if they have taken the vaccine.*

36.9% completed their first dose of vaccine and 56.5% completed both first and second doses of vaccine. 6.5% were not vaccinated. Majority of population were taken the vaccine.



*Pie diagram showing the response of participants regarding their willingness to take the vaccine.*

Among the non vaccinated people (6.5%), 80% shows their willingness to take the vaccine and 20% were unwilling to take the vaccine.



*Pie diagram showing the response of participants regarding if they have taken the vaccine because it was legally mandatory.*

69.6% of the population have taken the vaccine because it was legally mandatory and 30.4% have taken it in their own interest.

#### 4.4 BARRIERS ASSOCIATED WITH COVID-19 VACCINE

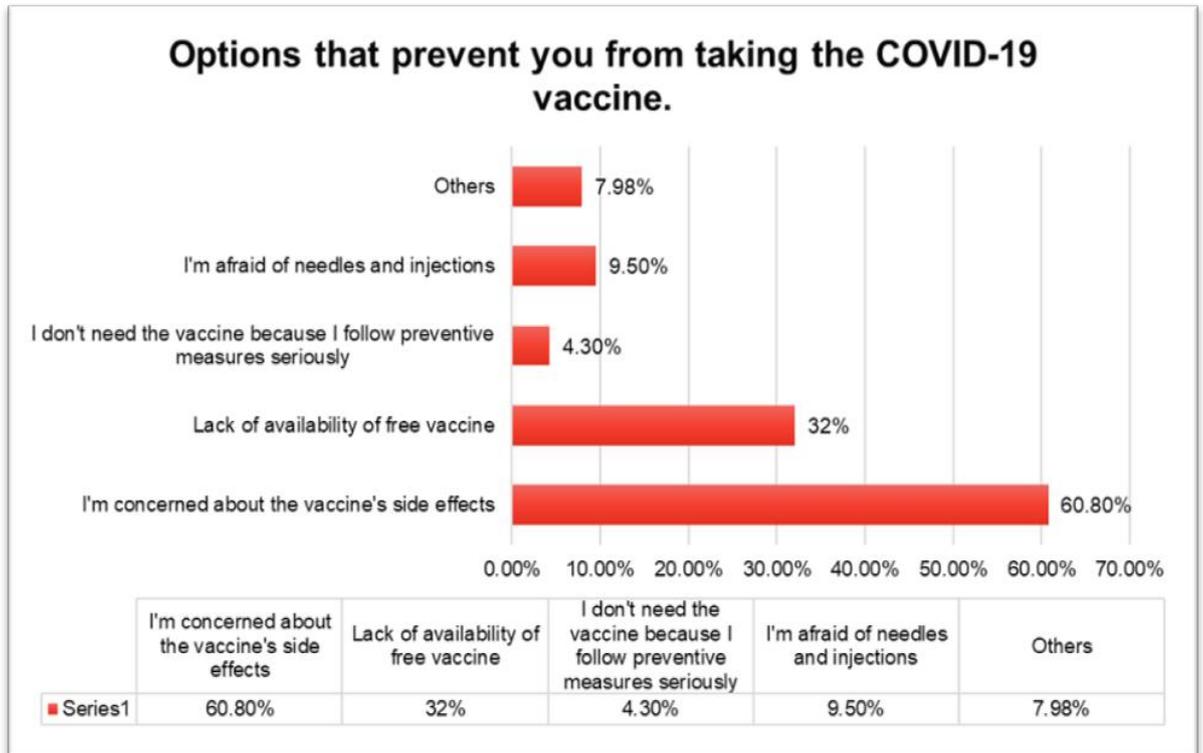


Figure 4.2: The response of participants regarding the barriers associated with COVID-19 vaccination. The cumulative percentages exceeded beyond 100% since the participants can choose more than one answer

A single question with several reasons was used to investigate the challenges to COVID-19 vaccine acceptance. 60.8% were anxious about the side effects of the vaccine, and 32% reported the lack of availability of free vaccine as a factor that prevented them from taking the vaccine. 9.50% of the population are reluctant to get vaccinated due to the fear of needles and injections. 4.30% of the population don't think they need to be vaccinated because they believe they are taking enough preventive measures and 7.98% for other reasons.

## 4.5 FACTORS THAT CAN IMPROVE THE ACCEPTANCE OF VACCINE

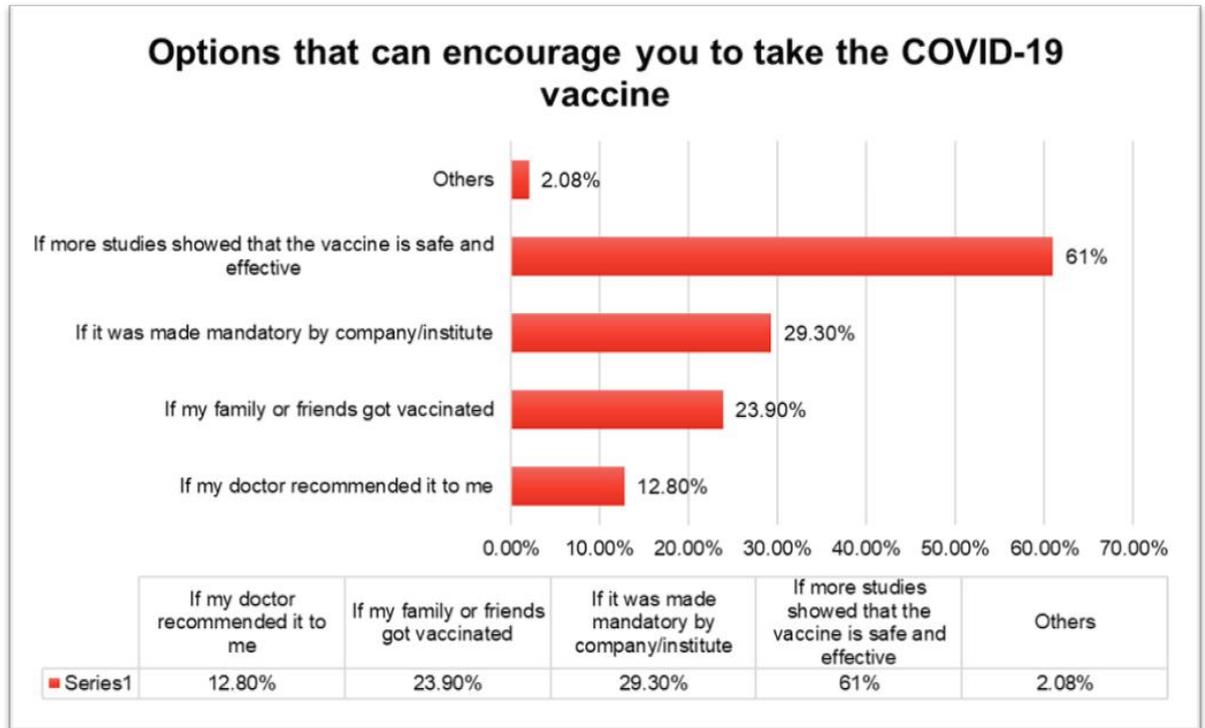


Figure 4.3: The response of participants regarding the factors that can encourage them to take COVID-19 vaccination. The cumulative percentages exceeded beyond 100% since the participants can choose more than one answer

Using a single question with various responses, the factors that can induce participants to take the COVID-19 vaccine were investigated. About 61% believed the increase in studies that showed the effectiveness and safety of COVID-19 vaccine could increase the level of acceptance. More than 29% thought that making vaccination mandatory in institutes would improve its acceptance. 23.80% responded that family or friends getting vaccinated would increase their acceptance. 12.80% agree that their doctors recommendation would improve the level of acceptance of the COVID vaccine, and 2.08% think there are other options to encourage people to get vaccinated.

## 4.6 COMPARATIVE STUDY

### 4.6.1 Relation between education and acceptance of COVID-19 vaccine

$H_0$ : There is no relationship between education and acceptance of COVID-19 vaccine.

$H_1$ : There is relationship between education and acceptance of COVID-19 vaccine.

Critical value = 0.05

If p-value is greater than 0.05, we accept  $H_0$

If p-value is less than 0.05, we accept  $H_1$

Preference	SSLC or Less	Plus two	UG/Graduation	Post Graduation	Total
Yes	12	87	148	12	259
No	8	9	13	1	31
Total	20	96	161	13	290

Table 4.1: Observed frequency

Preference	SSLC or Less	Plus two	UG/Graduation	Post Graduation	Total
Yes	17.86206897	86.10309278	143.7896552	11.61034483	259
No	2.137931034	10.26206897	17.21034483	1.389655172	31
Total	20	99	161	13	290

Table 4.2: Expected frequency

Here,

p-value = 0.000221972 < 0.05

Therefore we reject  $H_0$  and accept  $H_1$ .

There is relationship between education and acceptance of Covid-19 vaccine. Acceptance of Covid-19 vaccine is more among educated people.

### 4.6.2 Relation between residence and acceptance of COVID-19 vaccine

$H_0$ : There is no relationship between residence and acceptance of COVID-19 vaccine.

$H_1$ : There is relationship between residence and acceptance of COVID-19 vaccine.

Critical value = 0.05

Preference	Urban	Rural	Total
Yes	136	118	254
No	114	76	190
Total	250	194	444

Table 4.3: Observed frequency

Preference	Urban	Rural	Total
Yes	143.018018	110.981982	254
No	106.981982	83.01801802	190
Total	250	194	444

Table 4.4: Expected frequency

Here,

$$p\text{-value} = 0.174736974 > 0.05$$

Therefore we accept  $H_0$

There is no relationship between residence and acceptance of COVID-19 vaccine.

Vaccine acceptance is similar in both urban and rural areas.

### 4.6.3 Relation between taking the vaccine and vaccine being legally mandatory

$H_0$ : There is no relationship between taking the vaccine and vaccine being legally mandatory.

$H_1$ : There is relationship between taking the vaccine and vaccine being legally mandatory.

Critical value = 0.05

Preference	Legally Mandatory	Not Mandatory	Total
Yes	287	128	415
No	22	7	29
Total	309	135	444

Table 4.5: Observed frequency

Preference	Legally Mandatory	Not Mandatory	Total
Yes	288.8175676	126.1824324	415
No	20.18243243	8.817567568	29
Total	309	135	444

Table 4.6: Expected frequency

Here,

p-value = 0.44790057 > 0.05

Therefore we accept  $H_0$

That is there is no relationship between uptake of vaccine and vaccine being legally mandatory.

#### 4.6.4 Relation between occupation and acceptance of COVID-19 vaccine

$H_0$ : There is no relationship between occupation and acceptance of COVID-19 vaccine.

$H_1$ : There is relationship between occupation and acceptance of COVID-19 vaccine.

Critical value = 0.05

Preference	Government Job	Private Job	Student	Unemployed	Total
Yes	12	54	329	20	415
No	1	4	22	2	29
Total	13	58	351	22	444

Table 4.7: Observed frequency

Preference	Government Job	Private Job	Student	Unemployed	Total
Yes	12.1509009	54.21171171	328.0743243	20.56306306	415
No	0.849099099	3.788288288	22.92567568	1.436936937	29
Total	13	58	351	22	444

Table 4.8: Expected frequency

Here,

$p\text{-value} = 0.956724923 > 0.05$

Therefore we accept  $H_0$

There is no relationship between occupation and acceptance of Covid 19 vaccine.

Occupation is not a requirement for vaccination uptake.

## Chapter 5

# CONCLUSION

---

Vaccination is considered the most significant achievement in public health. They need to be produced on an immense scale, priced affordably, and allocated globally so that they are available where and when required. Another major challenge is public confidence and acceptance. Many factors, like geography, time, social class, contextual human behavior, and ethnicity, are affecting public confidence and acceptance of vaccination. This study was conducted to assess the public's acceptance and concerns regarding vaccination against COVID-19 disease.

A total of 444 people participated in the survey. Approximately 93.4% were vaccinated, while 6.6% were not. At present, the number of studies regarding the COVID-19 vaccine acceptance is limited, although several studies are being conducted all around the world. Our results indicate that vaccine acceptance is 86.3%, which is in accordance with the results obtained from the studies conducted in Kerala. The study conducted in Kerala reported that 84% were vaccinated and 16% were not vaccinated among the general population. In this study, they also used chi-square to find the acceptance of the COVID-19 vaccine. The study conducted in Kerala, which shows a positive attitude towards vaccination, was reassembled with our study.

The major reasons for the hesitancy reported by those unwilling to take the vaccine are anxiety about the adverse reactions and concerns regarding the efficiency of the vaccine. In our study also, the major reason for hesitancy was anxiety about the side effects of the COVID-19 vaccine. In another study conducted in

India, 55.6% believe that the COVID vaccination is safe and 46.2% believe that it will be effective. In our study, 59.9% believe that COVID-19 vaccination is safe and 57.9% believe it will be effective. 51.8% agreed that vaccination is the best immunisation method against COVID-19, and the study in India reported that vaccination is the best way to avoid the complications of COVID-19 disease.

In terms of vaccination acceptance techniques, we discovered that more people are concerned about vaccine safety and efficacy. Based on the general response, more individuals will accept vaccines if further studies are undertaken to evaluate their usefulness and safety. The current study has certain limitations because it was conducted utilising an online self-administered questionnaire. Several factors, such as internet accessibility and social media platform access, may have a direct impact on the survey population. To begin with, the study sample was primarily composed of people between the ages of 19 and 29. It's possible that a large amount of the "not sure" responses to vaccine views are attributable to widespread vaccination rumours. Another drawback of the study was that responses were recorded electronically using sophisticated methods that are not popular among senior citizens.

The study reveals a good level of acceptance regarding vaccination among the population study. The study's main findings can be used to help organise vaccination efforts. Concerns about the acceptance of COVID-19 vaccinations were discovered by the study, offering a crucial perspective for prospective interventional educational programmes to improve immunisation rates. Concerns about vaccination adverse effects were also highlighted as a major obstacle to vaccine adoption, according to the study. The quick development of the COVID-19 vaccine could have contributed to the establishment of public concerns. These worries have the potential to stymie the scientific community's progress by preventing the vaccine from being widely distributed. Furthermore, if additional studies can validate the safety and effectiveness of current vaccine candidates, vaccine acceptance can be raised among the community.

The study shows the positive attitude towards Covid-19 vaccine. It also identi-

fies the existence of a relation between education and acceptance of the vaccine. As people have better knowledge about the vigorous impact of COVID, they consider vaccination as an essential tool. Also, COVID 19 rattled everyone irrespective of their place of residence. The fear of getting affected by COVID is also universal. So there is no relation between the acceptance of COVID vaccine and the place of residence. Even though vaccination is legally mandatory, it doesn't affect the acceptance rate. The study also shows that there is no relationship between occupation and vaccine acceptance. This means that everyone, whether a student, an employee, or an unemployed person, accepts the COVID-19 vaccine equally. The major concerns from the respondents were about the unavailability of free vaccines and its side effects. Due to unavailability, and people's assumptions about the side effects, people tend not to get vaccinated. The study also identifies the key barrier for the acceptance of COVID vaccine is the concerns regarding its side effects.

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---

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countering\\_vaccine\\_hesitancy.html](https://www.aafp.org/journals/fpm/blogs/inpractice/entry/countering_vaccine_hesitancy.html)

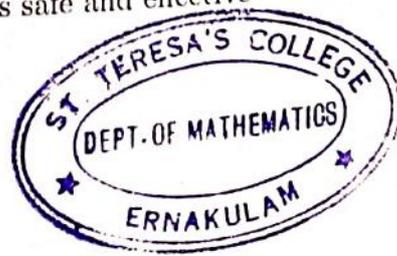
# ANNEXURE

---

## QUESTIONNAIRE :

1. Gender
  - Male
  - Female
2. Age
3. Type of residence
  - Urban
  - Rural
4. Your educational qualification
  - SSLC or Less
  - Plus Two (Pre-degree)
  - Plus Two (Pre-degree)
  - Post Graduation
  - Other
5. Your Occupational status
  - Student
  - Unemployed
  - Private Job
  - Government Job
6. Your Annual Income
7. Have you taken the COVID - 19 vaccine?
  - Yes (first dose)
  - Yes (taken both doses)
  - No
8. Are you planning to take the COVID-19 vaccine if you have not taken it yet?
  - Yes

- No
9. Did you take or is planning to get the COVID-19 vaccine because it is legally mandatory?
- Yes
  - No
10. Do you believe that the COVID-19 vaccine is safe?
- Yes
  - No
  - Not sure
11. Do you believe that the COVID-19 vaccine is effective?
- Yes
  - No
  - Not sure
12. Do you believe that getting vaccinated is the best method to prevent COVID-19 complications?
- Yes
  - No
  - Not sure
13. Options that prevent you from taking the COVID-19 vaccine.
- I am concerned about the vaccine's side effects
  - Lack of availability of free vaccine
  - I don't need the vaccine because I follow preventive measures seriously
  - I am afraid of needles and injections
  - Other
14. Options that can encourage you to take the COVID-19 vaccine.
- If my doctor recommended it to me
  - If my family or friends got vaccinated
  - If it was made mandatory by company/institute
  - If more studies showed that the vaccine is safe and effective
  - Other



**ST. TERESA'S COLLEGE**  
**(AUTONOMOUS) AFFILIATED TO MAHATMA GANDHI UNIVERSITY**



**TRES WHEEL**  
**PROJECT REPORT**

In partial fulfilment of the requirements for the award of the degree of

**BACHELOR OF SCIENCE IN**  
**COMPUTER APPLICATIONS**  
**[TRIPLE MAIN]**

Submitted By

**Lakshmi T R**

III B.Sc. Computer Applications [Triple main]

Register No: SB19CA017

Under the guidance of

Mrs. Harsha K M

**DEPARTMENT OF COMPUTER APPLICATIONS**

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2019-2022



## **CERTIFICATE**

This is to certify that **Ms. LAKSHMI T R. (Reg. No: SB19CA017)** Bachelor of Science In Computer Applications (Triple main) VI semester student of **ST. TERESA'S COLLEGE ERNAKULAM** affiliated to Mahatma Gandhi university, has done project work entitled "**TRES WHEEL**" in PYTHON+ANDROID under the guidance of our senior faculties towards the fulfillment of the award of "Bachelor of Science In Computer Applications (Triple Main)" during the period of October 2021 to March 2022.

She successfully completed the project and during the period she was methodical and hardworking.

**For RISS TECHNOLOGIES**

A handwritten signature in green ink, appearing to read "Deborah M", is written over a horizontal line.

Executive Officer

Chief





## CERTIFICATE

This is to certify that the project report entitled "TRES WHEEL" a bona fide record of the work done by Lakshmi T R during the year 2021-22 and submitted in partial fulfilment of the requirements for the degree of Bachelor of Science in Computer Applications (Triple main) under Mahatma Gandhi University.

*Rds*

Head of the Department



*Joni*  
Internal Examiner

*JG/4/22*  
External Examiner

## **DECLARATION**

I, Lakshmi T R , Bsc computer Applications [triple main] final year student of St. Teresa's college ( Autonomous) Ernakulam, Register no. SB19CA017, hereby declare that the dissertation submitted for the Bachelor's degree in computer Applications is my original work. I further declare that the said work has not previously been submitted to any other university or academic body.

Date:

Place: Ernakulam

Lakshmi T R

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We convey my hearty thanks to my parents for the moral support, suggestion and encouragement.

## **SYNOPSIS**

Tres wheel project intends to provide passengers to book an auto rickshaw. Tres wheel driver application will help auto drivers locate passengers and connect with them. Even though several applications are available for auto rickshaw booking, there is none specifically for Tres wheel. Hence, this project aims to assure safety of customers. A “send message” option in the application allows the passenger to inform the already specified contact in the case of an emergency. The app works using GPS and the details of the customers are encoded in the system.

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# **1. INTRODUCTION**

## **1.1 About Project**

The auto rickshaw booking applications are a solution to several problems like reducing the waiting time on the road, looking out for auto rickshaws under the sun, and several other things. There are several benefits one can draw from these apps. Apart from the passengers, there are several advantages for the drivers as well.

The Tres wheel app provides the riders to book auto rickshaw for traveling one place to another. And Tres wheel driver app provides the drivers to connect rider and leave from the place they halted at. Customers will not be charged for using the app services and will only need to pay drivers for the commute. This application provides a “send message” option for passengers to send an alert message including live location in the case of an emergency.

## **1.2 About Organization**

RISS TECHNOLOGIES is a rapidly growing company that provides professional IT services. They are one of the largest and Best software development companies in Kerala with focus on .Net, PHP, Java, Software testing, SEO and Web Design.

## **1.3 Objectives of the Project and the Organization**

The main objective of the project for riders is to assure safe, affordable rides at your doorstep. And for drivers, they do not have to roam around the city wasting their gas in search of riders. Meanwhile, they can just wait for a booking to arrive and then leave from the place they halted at.

The main objective of the organisation is to continuously optimize their customers' business through our world-class solutions; services and products. They ensure the success of the company by constantly and consistently satisfying the customers, shareholders and employees.

## **2. SYSTEM ANALYSIS**

## **2.1 Introduction**

System Analysis is the complete study of the system and identifying its objectives mainly for problem solving purposes. Each and every modules of the system are evaluated. Inferences are made from these studies to ensure that all the components of the system is working efficiently.

System Analysis involves gathering information related to the system and developing the accurate tools for analysis. Studying and analysing the existing system is important for system analysis. Identifying the drawbacks in the existing system and how it is been rectified in the proposed system is one of the main aim.

## **2.2 Existing System**

The passengers have to waiting on the road looking for an auto rickshaws under the sun; and drivers have to roam around the city wasting their gas in search of riders.

All these procedures take tremendous amount of time and are difficult to track their progress.

## **2.3 Proposed System**

The proposed system focuses on providing an online app/platform where the passengers can easily book their rides gets a safe journey; and can just wait for a booking to arrive and then leave from the place they halted at.

There are two types of user in the system:

### 1. Drivers

The drivers have to create an account in the app. In the registration page, the driver will have to enter their first name and last name, house name, city, pin code, gender, email, date of birth, phone number, licence number, driver's photo, experience, date of joining, status, username and password. These details will be stored in the registration database. Next is the login page where the driver has to log in to the account by using the already created username and password, which will be fetched from the database so as to check for errors. Once the user logs

into the account, they have to enter their vehicle details in my vehicle page. The vehicle details includes their vehicle type, number of seats, vehicle number, amount per km, availability. Their vehicle details will be stored in the corresponding vehicle details database. The driver will be able to view their ride request in the request page. The app will shows the current pick up point in the route page. The driver will also be able to share the ride request to other riders for accepting the ride in case of any other reason in the driver who shared the ride. Driver can be able to view the payment history in the payment page. And they can also be able to view the rating that got from the riders.

## 2. Rider

The rider have to create an account in the app. In the registration page, the driver will have to enter their first name and last name, gender, email, phone number, username and password. These details will be stored in the registration database. Next is the login page where the rider has to log in to the account by using the already created username and password, which will be fetched from the database so as to check for errors. Rider can request the ride in the request ride page. And can view the accepted rides in the request status page. Rider can send a “help me” message including live location in case of any emergency in the home page. Rider can be able to send complaints to admin and can also be able to view replay send by admin in the complaint page. The rider can add ratings in the add rating. And also be able to send feedback to admin in the feedback page.

## **2.4 System Specification**

System specification specifies the hardware and software configuration of the new system. It helps to define the operational and performance guidelines of the system.

## **2.5 Operating System**

An Operating System (OS) is an interface between computer user and computer hardware. It is a software which performs all the basic tasks like file management, memory management, process management, handling input and output and controlling peripheral devices such as disk drives and printers. The operating system required for proper execution of the system is Windows 10 or above. System specifications for the app to run:

- Android min SDK 23 – Marshmallow

## **2.6 Languages and Software Packages**

### **✦ Python**

Python is a widely used high-level programming language for general-purpose programming, created by Guido van Rossum and first released in 1991. An interpreted language, Python has a design philosophy that emphasizes code readability (notably using whitespace indentation to delimit code blocks rather than curly brackets or keywords), and a syntax that allows programmers to express concepts in fewer lines of code than might be used in languages such as C++ or Java. The language provides constructs intended to enable writing clear programs on both a small and large scale.

### **✦ MySQL**

MySQL is the most popular Open-Source Relational SQL Database Management System. MySQL is used for developing various web-based software applications.

## **2.7 Hardware and Software Specifications**

### **Software Requirements**

- Operating System: WINDOWS 10
- Front end: HTML, Python (For web application), Android (Mobile Application)
- Back end: MYSQL
- Software: Sublime Text, WAMP, Android Studio
- Web Browser: Internet Explorer/Google Chrome/Firefox
- Web Server: Apache

### **Hardware Requirements**

- Processor: AMD A6-7310 APU with AMD Radeon R4 Graphics 2.00 GHz.
- RAM: 4GB
- Hard Disc: 261GB.

## **3. SYSTEM DESIGN**

### 3.1 Introduction

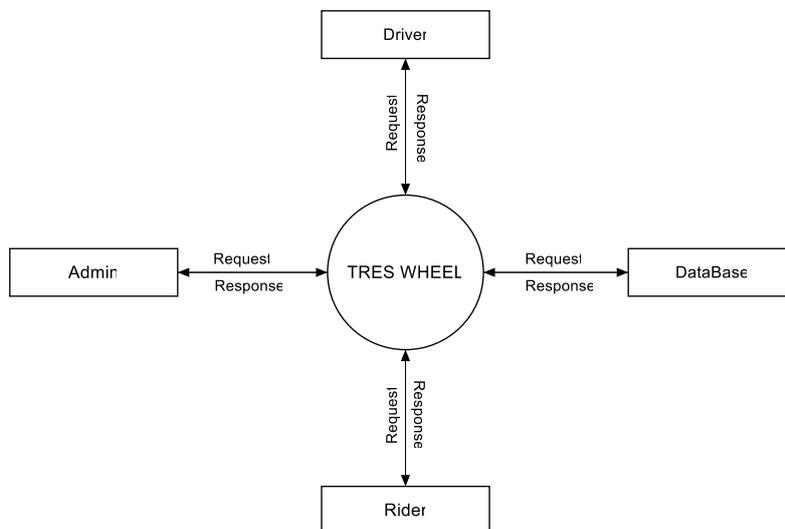
It is a process of planning a new business system or replacing an existing system by defining its components or modules to satisfy the specific requirements. Mainly focuses on how to accomplish the objectives of the system.

### 3.2 Data Flow Diagram

A data flow diagram (DFD) is a graphical representation of the flow of data through an information system. A DFD is often used as a primary step to create an overview of the system, which can later be elaborated.

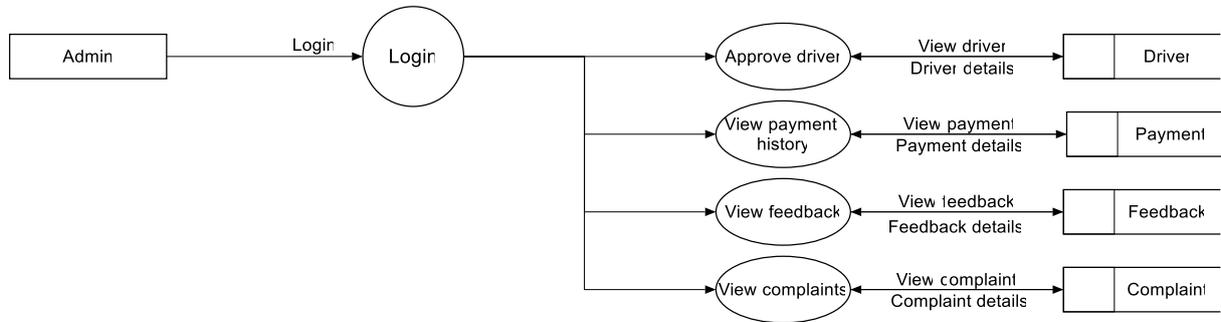
A DFD shows what will be the input of the system as well as the output. It clearly represents where the data will come from and go to, and where the data will be stored.

#### DFD Level Zero (contextual level)

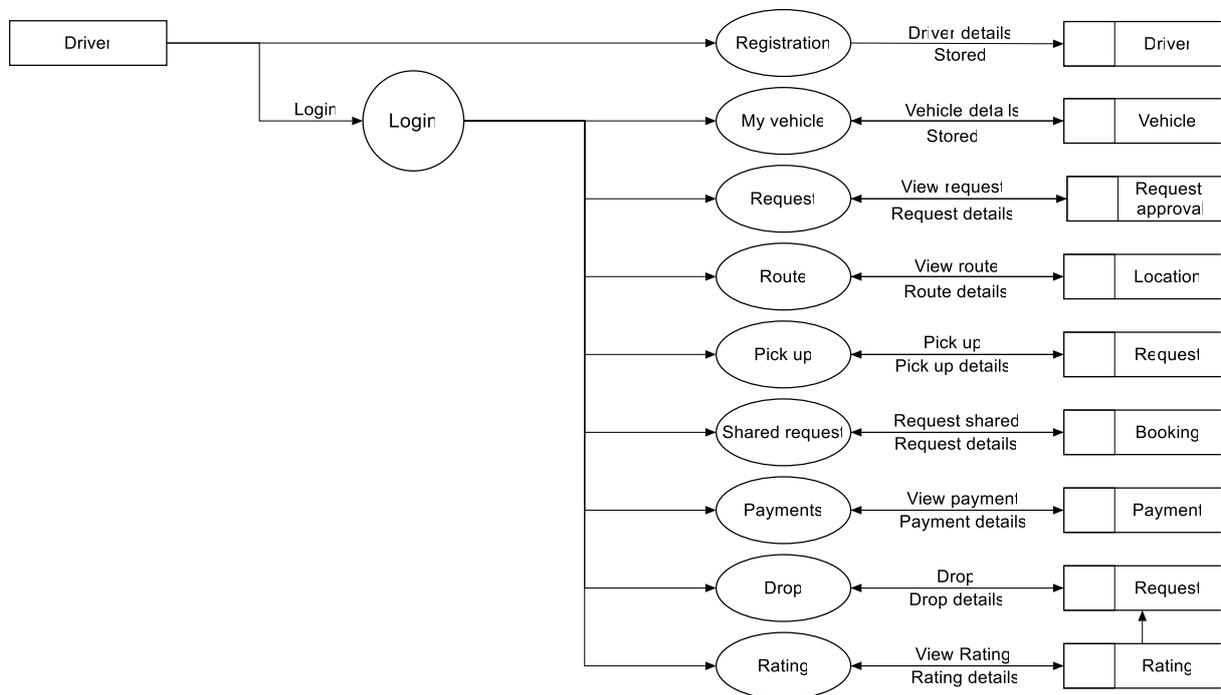


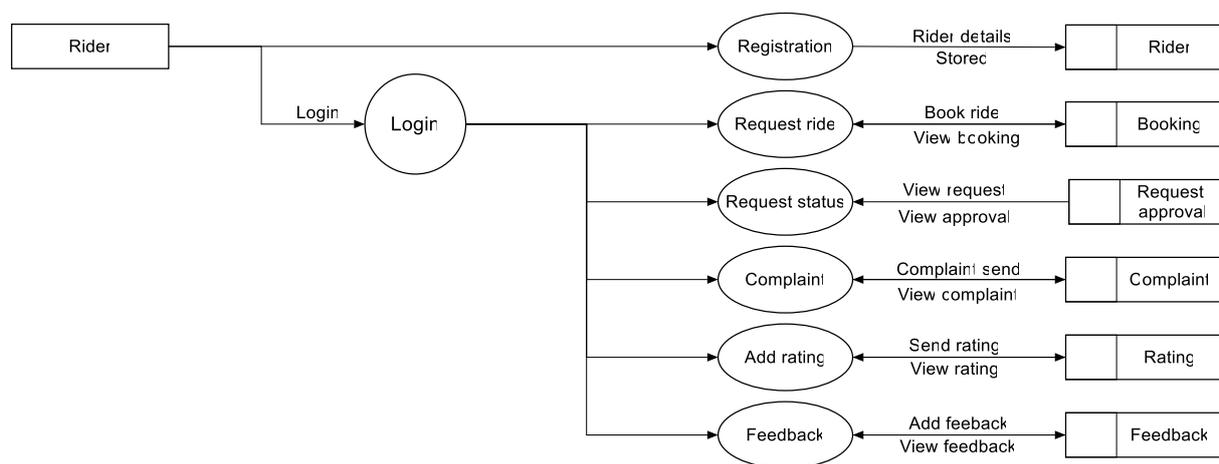
## DFD Level One

### Admin:



### Driver:



**Rider:****3.3 Data Dictionary**

A data dictionary contains metadata. The data dictionary is very important as it contains information such as what is in the database, who is allowed to access it, where is the database physically stored etc. The users of the database normally don't interact with the data dictionary, it is only handled by the database administrators.

**3.4 Database Design**

**Database Design** is a collection of processes. The main aim of database designing is to produce logical and physical design models for the suggested database system.

The logical model focuses on the data requirements and the data to be stored independent of physical components.

The physical data design model translates the logical design of the database onto physical media using hardware resources and software systems.

**tbl\_driverregistration**

Column	Type	Null	Default
driver_id	int(10)	No	
driver_fname	varchar(50)	Yes	
driver_lname	varchar(50)	Yes	
driver_hname	varchar(50)	Yes	
driver_city	varchar(50)	Yes	
driver_pincode	varchar(50)	Yes	
driver_gender	varchar(50)	Yes	
driver_email	varchar(50)	Yes	
driver_dob	varchar(50)	Yes	
driver_phn	varchar(50)	Yes	
driver_lisence	varchar(50)	Yes	
driver_photo	varchar(50)	Yes	
driver_exp	varchar(50)	Yes	
driver_doj	varchar(50)	Yes	
driver_status	varchar(50)	Yes	
loginid	int(10)	Yes	

**tbl\_riderregistration**

Column	Type	Null	Default
rider_id	int(10)	No	
ride_fname	varchar(50)	Yes	
rider_lname	varchar(50)	Yes	
rider_gender	varchar(50)	Yes	
rider_phnumber	varchar(50)	Yes	
rider_email	varchar(50)	Yes	
loginid	int(10)	Yes	
contact_number	varchar(100)	Yes	

**tbl\_booking**

<b>Column</b>	<b>Type</b>	<b>Null</b>	<b>Default</b>
book_id	int(10)	No	
rider_id	int(10)	Yes	
vehicle_id	int(10)	Yes	
booking_from	varchar(50)	Yes	
booking_to	varchar(50)	Yes	
booking_date	varchar(50)	Yes	
booking_time	varchar(50)	Yes	
amount	varchar(50)	Yes	
booking_status	varchar(50)	Yes	
req_id	int(10)	Yes	

## **4. SYSTEM DEVELOPMENT**

## **4.1 Introduction**

Software Development is the process of analysing, designing, testing, implementation and maintenance. It is called Software Development Life Cycle (SDLC). Different SDLC include waterfall, prototyping, iterative, incremental, spiral development, rapid application development and agile methodology.

## **4.2 Process Description**

Different processes of each module are as given below:

### **Driver:**

- **Driver Registration**

The user has to enter their first name and last name, house name, city, pin code, gender, email, date of birth, phone number, licence number, driver's photo, experience, date of joining, status, username and password in the registration fragment.

- **Driver Login**

The user must enter the existing username and password to log into their account in the login fragment.

- **My vehicle**

As soon as the driver enters their vehicle name and type, available number of seats, vehicle number, and amount per km.

- **Request**

In the request fragment, the driver can view the ride request and can accept or reject the ride.

- **Route**

In the route fragment shows the route of passengers pick up point.

- **Pick up**

Driver can view the current ride and click the "pick up" button after pick up the passenger.

- **Shared Request**

Driver can share the ride when they are in another ride or any other reasons.

- **Payments**

In this payment fragment shows the payment history of all rides.

- **Drop**  
Driver can view the current ride and click the “drop” button after drop the passenger.
- **Rating**  
Driver can view the ratings that entered the passengers.

## **Rider:**

- **Rider registration**  
The user has to enter their first name and last name, gender, email, phone number, username and password in the registration fragment.
- **Rider login**  
The user must enter the existing username and password to log into their account in the login fragment.
- **Request ride**  
Rider can send a request for their rides. They can enter the destination and number of passengers in the request ride fragment.
- **Request Status**  
Rider can show the accepted request and they can make payment and also can track driver.
- **Share**  
Rider can share their rides to others.
- **Send message**  
This button is to send a “help me” message including the riders live location in the case of an emergency.
- **Complaint**  
Riders can enter their complaints about the driver or app to admin. And also they can view the replay that send by the admin.
- **Add rating**  
Rider can rate the ride.
- **Feedback**  
Rider can send feedback about the app, or about the driver.

## **Logout**

Switch the home page into login page.

### 4.3 Code Design

*Driver:*

#### REGISTER

```
public class Register extends Activity {
    EditText e1,e2,e3,e4,e5,e6,e7,e8,e9,e10,e11,e12;
    Button b,b1;
    Spinner sp;
    String data;
    String q;
    String fpth = "";

    String y = "";
    String path, pathname;
    int flag = 0;
    String [] exp={"less than 1 year","1 year","2 year","3 year","4 year","5 year","more than 5
year"};
    RadioButton r1,r2,r3;
    String fname,lname,hname,gender,city,pincode,phone,email,dob,license,doj,uname,pass;
    String method="driver_register";
    String namespace="http://tempuri.org/";
    SharedPreferences sh;
    File f;
    byte[] byteArray = null;

    private static final int CAMERA_CODE = 101, GALLERY_CODE = 201,
CROPING_CODE = 301;
    private Uri mImageCaptureUri;
    private File outPutFile = null;
    private String imagename = "";
    String encodedImage;
    ImageView im1;

    String soapaction=namespace+method;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_register);
        e1=(EditText)findViewById(R.id.editText1);
        e2=(EditText)findViewById(R.id.editText2);
        e3=(EditText)findViewById(R.id.editText3);
        e4=(EditText)findViewById(R.id.editText4);
        e5=(EditText)findViewById(R.id.editText5);
        e6=(EditText)findViewById(R.id.editText6);
        e7=(EditText)findViewById(R.id.editText7);
```

```

e8=(EditText)findViewById(R.id.editText8);
e9=(EditText)findViewById(R.id.editText9);
e10=(EditText)findViewById(R.id.editText10);
e11=(EditText)findViewById(R.id.ed_uname);
e12=(EditText)findViewById(R.id.ed_pass);
sp=(Spinner)findViewById(R.id.spinner1);
sp.setAdapter(new ArrayAdapter<String>(getApplicationContext(),
android.R.layout.simple_list_item_1,exp));
r1=(RadioButton)findViewById(R.id.radio0);
r2=(RadioButton)findViewById(R.id.radio1);
r3=(RadioButton)findViewById(R.id.radio2);
b=(Button)findViewById(R.id.button1);
b1=(Button)findViewById(R.id.bt_browse);
im1=(ImageView)findViewById(R.id.imageView1);
b1.setOnClickListener(new View.OnClickListener() {

    @Override
    public void onClick(View arg0) {
        // TODO Auto-generated method stub
        flag = 1;
        selectImageOption();

    }
});
b.setOnClickListener(new View.OnClickListener() {

    @Override
    public void onClick(View arg0) {
        // TODO Auto-generated method stub
        fname=e1.getText().toString();
        lname=e2.getText().toString();
        city=e4.getText().toString();
        hname=e3.getText().toString();
        pincode=e5.getText().toString();
        email=e6.getText().toString();
        dob=e7.getText().toString();
        phone=e8.getText().toString();
        license=e9.getText().toString();
        doj=e10.getText().toString();
        uname=e11.getText().toString();
        pass=e12.getText().toString();

        if(r1.isChecked())
        {
            gender="male";
        }
        else if(r2.isChecked())

```

```
{
    gender="female";
}
else
{
    gender="others";
}
if(fname.equalsIgnoreCase(""))
{

    e1.setError("please fill this field");
    e1.setFocusable(true);
}
else if(lname.equalsIgnoreCase(""))
{

    e2.setError("please fill this field");
    e2.setFocusable(true);
}

else if(hname.equalsIgnoreCase(""))
{

    e3.setError("please fill this field");
    e3.setFocusable(true);
}
else if(city.equalsIgnoreCase(""))
{

    e4.setError("please fill this field");
    e4.setFocusable(true);
}
else if(pincode.equalsIgnoreCase(""))
{

    e5.setError("please fill this field");
    e5.setFocusable(true);
}
else if(pincode.length()!=6)
{

    e5.setError("please enter a valid pincode");
    e5.setFocusable(true);
}
else if(email.equalsIgnoreCase(""))
{
```

```
e6.setError("please fill this field");
e6.setFocusable(true);
} else if(!Patterns.EMAIL_ADDRESS.matcher(email).matches())
{

    e6.setError("enter valid email address");
    e6.setFocusable(true);
}

else if(dob.equalsIgnoreCase(""))
{

    e7.setError("please fill this field");
    e7.setFocusable(true);
}
else if(phone.equalsIgnoreCase(""))
{

    e8.setError("please fill this field");
    e8.setFocusable(true);
}
else if(!Patterns.PHONE.matcher(phone).matches())
{

    e8.setError("enter valid phone number");
    e8.setFocusable(true);
}
else if(phone.length() != 10)
{

    e8.setError("enter valid phone number");
    e8.setFocusable(true);
}
else if(license.equalsIgnoreCase(""))
{

    e9.setError("please fill this field");
    e9.setFocusable(true);
}
else if(doj.equalsIgnoreCase(""))
{

    e10.setError("please fill this field");
    e10.setFocusable(true);
}
else if(uname.equalsIgnoreCase(""))
{
```

```

        e11.setError("please fill this field");
        e11.setFocusable(true);
    }
    else if(pass.equalsIgnoreCase(""))
    {

        e12.setError("please fill this field");
        e12.setFocusable(true);
    }
    else
    {

        uploadData();

    }
    }
    });
}
private void uploadData() {

    try {
        q="http://" + IPSETTING.ipval + "/api/registration";
        FileUpload client = new FileUpload(q);
        client.connectForMultipart();

        client.addFormPart("fname", fname);
        client.addFormPart("lname", lname);
        client.addFormPart("gender", gender);
        client.addFormPart("hname", hname);
        client.addFormPart("city", city);
        client.addFormPart("pincode", pincode);
        client.addFormPart("email", email);
        client.addFormPart("dob", dob);
        client.addFormPart("phone", phone);
        client.addFormPart("license", license);
        client.addFormPart("doj", doj);
        client.addFormPart("exp", sp.getSelectedItem().toString());
        client.addFormPart("uname", uname);
        client.addFormPart("pass", pass);

        client.addFilePart("photo", "abc.jpg", byteArray);

        // Toast.makeText(getApplicationContext(),
        "f"+fname+"l"+lname+"d"+dob+"e"+email+"p"+phone+"u"+uname+"p"+pa+"g"+gen+"de"+

```

```

desc+"c"+city+"di"+dist+"s"+state+"c"+country+"img"+byteArray,
Toast.LENGTH_LONG).show();
//      client.addFilePart("image", "abc.jpg", bitmapdata);
      client.finishMultipart();
      data = client.getResponse();
      Log.d("llllllll", data);
      JSONObject ob = new JSONObject(data);
//      JSONArray ar=new JSONArray(data);
      if (ob.getString("status").equals("success")) {
          Toast.makeText(getApplicationContext(), "Registered.!",
Toast.LENGTH_LONG).show();
          startActivity(new Intent(getApplicationContext(), Login.class));
      }

      Log.d("response=====", data);
  } catch (Exception e)
  {
//      Toast.makeText(getApplicationContext(), "Exception 123 : " + e,
Toast.LENGTH_LONG).show();
          Toast.makeText(getApplicationContext(), "Please browse image...",
Toast.LENGTH_LONG).show();

          Log.d("jjj", e.toString());
      }
  }

private void selectImageOption() {
    final CharSequence[] items = {"Capture Photo", "Choose from Gallery", "Cancel"};

    AlertDialog.Builder builder = new AlertDialog.Builder(this);
    builder.setTitle("Add Photo!");
    builder.setItems(items, new DialogInterface.OnClickListener() {
        @Override
        public void onClick(DialogInterface dialog, int item) {

            if (items[item].equals("Capture Photo")) {
                Intent intent = new Intent(MediaStore.ACTION_IMAGE_CAPTURE);
                Date date = new Date();
                DateFormat df = new SimpleDateFormat("-mm-ss");
                imagename = df.format(date) + ".jpg";
                f = new File(android.os.Environment.getExternalStorageDirectory(), imagename);
                mImageCaptureUri = Uri.fromFile(f);
                intent.putExtra(MediaStore.EXTRA_OUTPUT, mImageCaptureUri);
                startActivityForResult(intent, CAMERA_CODE);

            } else if (items[item].equals("Choose from Gallery")) {
                Intent i = new Intent(Intent.ACTION_PICK,

```

```

android.provider.MediaStore.Images.Media.EXTERNAL_CONTENT_URI);
    startActivityForResult(i, GALLERY_CODE);

    } else if (items[item].equals("Cancel")) {
        dialog.dismiss();
    }
}
});
builder.show();
}

@Override
protected void onActivityResult(int requestCode, int resultCode, Intent data) {

    if (flag == 1) {
        super.onActivityResult(requestCode, resultCode, data);
        if (requestCode == GALLERY_CODE && resultCode == RESULT_OK && null !=
data) {

            mImageCaptureUri = data.getData();
            System.out.println("Gallery Image URI: " + mImageCaptureUri);
            // CroppingIMG();

            try {

                Uri selectedImage = data.getData();
                String path = getRealPathFromURI(selectedImage);
                File file = new File(path);
                pathname = path.substring(path.lastIndexOf("/") + 1);

                // image = decodeFile(path);
                byteArray = null;
                try {
                    InputStream inputStream = new FileInputStream(file);
                    ByteArrayOutputStream bos = new ByteArrayOutputStream();
                    byte[] b = new byte[2048 * 8];
                    int bytesRead = 0;

                    while ((bytesRead = inputStream.read(b)) != -1) {
                        bos.write(b, 0, bytesRead);
                    }

                    byteArray = bos.toByteArray();
                    Bitmap bm = BitmapFactory.decodeByteArray(byteArray, 0, byteArray.length);
                    im1.setImageBitmap(bm);
                }
            }
        }
    }
}

```

```

        } catch (IOException e) {

            Log.d("=err====", e.getMessage() + "");
            Toast.makeText(this, "String :" + e.getMessage().toString(),
Toast.LENGTH_LONG).show();
        }

        String str = Base64.encodeToString(byteArray, Base64.DEFAULT);
        encodedImage = str;
    } catch (Exception e) {

    }
} else if (requestCode == CAMERA_CODE && resultCode == Activity.RESULT_OK)
{

    System.out.println("Camera Image URI : " + mImageCaptureUri);
    // CroppingIMG();

//    String path = f.getAbsolutePath();

//    Bitmap image = decodeFile(path); //sha corrected
    try {
        Bundle extras = data.getExtras();
        Bitmap image = (Bitmap) extras.get("data");
        //Bitmap image = (Bitmap) data.getExtras().get("data");
        ByteArrayOutputStream baos = new ByteArrayOutputStream();
        image.compress(Bitmap.CompressFormat.JPEG, 100, baos);

        //im1.setImageBitmap(image);
    } catch (Exception e) {
        Toast.makeText(getApplicationContext(), e.toString(),
Toast.LENGTH_LONG).show();
    }

}

}

}

private String getRealPathFromURI(Uri contentURI) {
    String path;
    Cursor cursor = getContentResolver()
        .query(contentURI, null, null, null, null);
    if (cursor == null)
        path = contentURI.getPath();
}

```

```

else {
    cursor.moveToFirst();
    int idx = cursor.getColumnIndex(MediaStore.Images.ImageColumns.DATA);
    path = cursor.getString(idx);
}
if (cursor != null)
    cursor.close();
return path;
}

@Override
public boolean onCreateOptionsMenu(Menu menu) {
    // Inflate the menu; this adds items to the action bar if it is present.
    getMenuInflater().inflate(R.menu.register, menu);
    return true;
}
}

```

## **BOOKING**

```

public class ROUTE_VIEW extends Activity implements JsonResponse
{
    TextView t1,t2;
    String method="d_view_route";

    SharedPreferences sh;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_route__view);
        t1=(TextView)findViewById(R.id.textView2);
        t2=(TextView)findViewById(R.id.textView4);

        JsonRequest jr= new JsonRequest();
        jr.json_response=(JsonResponse)ROUTE_VIEW.this;
        String q="/d_view_route?drid=" + Login.logid;
        jr.execute(q);

    }
    public void response(JSONObject jo)
    {
        // TODO Auto-generated method stub
        try{

```

```

String status=jo.getString("status");
String method=jo.getString("method");
if(method.equalsIgnoreCase("d_view_route"))
{
    if(status.equalsIgnoreCase("success"))
    {
        JSONArray ja=(JSONArray)jo.getJSONArray("data");

        final String flatti=ja.getJSONObject(0).getString("flatitude");
        final String flongi=ja.getJSONObject(0).getString("flongitude");
        final String tlatti=ja.getJSONObject(0).getString("tlatitude");
        final String tlongi=ja.getJSONObject(0).getString("tlongitude");

        final String statuss=ja.getJSONObject(0).getString("status");

        if(statuss.equalsIgnoreCase("picked"))
        {
            t1.setVisibility(View.GONE);
            t2.setOnClickListener(new View.OnClickListener() {

                @Override
                public void onClick(View arg0) {
                    String url =
"http://www.google.com/maps?saddr="+flatti+" "+flongi+" "&&daddr="+tlatti+" "+tlongi;

                    Intent in = new Intent(Intent.ACTION_VIEW, Uri.parse(url));
                    startActivity(in);

                }
            });
        }
        else if(statuss.equalsIgnoreCase("approved"))
        {
            t1.setOnClickListener(new View.OnClickListener() {

                @Override
                public void onClick(View arg0) {

                    String url =
"http://www.google.com/maps?saddr="+LocationService.lati+" "+LocationService.logi+"
"+" "&&daddr="+flatti+" "+flongi;
                    Intent in = new Intent(Intent.ACTION_VIEW, Uri.parse(url));

```

```

        startActivity(in);
    }
});
t2.setOnClickListener(new View.OnClickListener() {

    @Override
    public void onClick(View arg0) {
        String url =
"http://www.google.com/maps?saddr="+flatti+" "+flongi+" "&&daddr="+tlatti+" "+tlongi;

        Intent in = new Intent(Intent.ACTION_VIEW, Uri.parse(url));
        startActivity(in);

    }
});

}
else
{
    t1.setText("currenty no ride is found here..");
    t2.setVisibility(View.GONE);
}
}

}
catch(Exception e)
{
    e.printStackTrace();
    Toast.makeText(getApplicationContext(), "exp : "+e, Toast.LENGTH_LONG).show();
}
}

@Override
public boolean onCreateOptionsMenu(Menu menu) {
    // Inflate the menu; this adds items to the action bar if it is present.
    getMenuInflater().inflate(R.menu.route__view, menu);
    return true;
}

}

```

**Rider:****REGISTER**

```

public class Registration extends Activity implements JsonResponse{
    EditText e1,e2,e3,e4,e5,e6,e7;

```

```

Button b;
RadioButton rmale,rfemale,rother;
String fname,lname,hname,gender,place,pincode,phone,email,uname,pass,cn;
String method="user_register";
SharedPreferences sh;
@Override
protected void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.activity_registration);

    e1=(EditText)findViewById(R.id.editText1);
    e2=(EditText)findViewById(R.id.editText2);
    e3=(EditText)findViewById(R.id.editText3);
    e4=(EditText)findViewById(R.id.editText4);
    e5=(EditText)findViewById(R.id.editText5);
    e6=(EditText)findViewById(R.id.editText6);
    e7=(EditText)findViewById(R.id.etcontact);

    rmale=(RadioButton)findViewById(R.id.radiomale);
    rfemale=(RadioButton)findViewById(R.id.radiofemale);
    rother=(RadioButton)findViewById(R.id.radioother);
    b=(Button)findViewById(R.id.button1);
    b.setOnClickListener(new View.OnClickListener() {

        @Override
        public void onClick(View arg0) {
            // TODO Auto-generated method stub
            fname=e1.getText().toString();
            lname=e2.getText().toString();
            phone=e3.getText().toString();
            email=e4.getText().toString();
            uname=e5.getText().toString();
            pass=e6.getText().toString();
            cn=e7.getText().toString();

            if(rmale.isChecked())
            {
                gender="male";
            }
            else if(rfemale.isChecked())
            {
                gender="female";
            }
            else if(rother.isChecked())
            {
                gender="others";
            }
        }
    });
}

```

```
}
if(fname.equalsIgnoreCase(""))
{

    e1.setError("please fill this field");
    e1.setFocusable(true);
}
else if(lname.equalsIgnoreCase(""))
{

    e2.setError("please fill this field");
    e2.setFocusable(true);
}

else if(phone.equalsIgnoreCase(""))
{

    e3.setError("please fill this field");
    e3.setFocusable(true);
}
else if(phone.length()!=10)
{

    e3.setError("enter valid phone number");
    e3.setFocusable(true);
}
else if(email.equalsIgnoreCase(""))
{

    e4.setError("please fill this field");
    e4.setFocusable(true);
}
else if(!Patterns.EMAIL_ADDRESS.matcher(email).matches())
{

    e4.setError("enter valid email address");
    e4.setFocusable(true);
}
else if(uname.equalsIgnoreCase(""))
{

    e5.setError("please fill this field");
    e5.setFocusable(true);
}
else if(pass.equalsIgnoreCase(""))
{
```

```

        e6.setError("please fill this field");
        e6.setFocusable(true);
    }
    else
    {
        JsonRequest jr= new JsonRequest();
        jr.json_response=(JsonResponse)Registration.this;
        String q="/user_register?fname="
+fname+"&lname="+lname+"&gender="+gender+"&phone="+phone+"&email="+email+"&
uname="+uname+"&pass="+pass+"&cn="+cn;
        jr.execute(q);

    }
    }
});
}
public void response(JSONObject jo)
{
    // TODO Auto-generated method stub
    try
    {
        String status=jo.getString("status");
        if(status.equalsIgnoreCase("success"))
        {
            Toast.makeText(getApplicationContext(), "success ",
Toast.LENGTH_LONG).show();
            Intent next = new Intent(getApplicationContext(),Login.class);
            startActivity(next);
        }
        else
        {
            Toast.makeText(getApplicationContext(), "Failed", Toast.LENGTH_LONG).show();
        }
    }
    catch(Exception e)
    {
        e.printStackTrace();
        Toast.makeText(getApplicationContext(), "exp : "+e, Toast.LENGTH_LONG).show();
    }
}
@Override
public boolean onCreateOptionsMenu(Menu menu)
{
    // Inflate the menu; this adds items to the action bar if it is present.
    getMenuInflater().inflate(R.menu.registration, menu);
    return true;
}

```

```

    }

    public void onBackPressed()
    {
        // TODO Auto-generated method stub
        super.onBackPressed();
        Intent b=new Intent(getApplicationContext(),Login.class);
        startActivity(b);
    }
}

```

## **RIDE REQUEST**

```

public class SEND_REQUEST extends Activity implements JsonResponse{

    EditText e1,e2,e3,e4;
    SharedPreferences sh;
    Button b;
    String travelto,no_of_pass,date,time,tolongi,tolatti;
    String [] vehtype,noofseat,vehno;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_send__request);
        sh=PreferenceManager.getDefaultSharedPreferences(getApplicationContext());

        e1=(EditText)findViewById(R.id.editText1);
        e2=(EditText)findViewById(R.id.editText2);
        b=(Button)findViewById(R.id.button1);

        b.setOnClickListener(new View.OnClickListener()
        {

            @Override
            public void onClick(View arg0)
            {
                // TODO Auto-generated method stub
                travelto=e1.getText().toString();
                no_of_pass=e2.getText().toString();

                if(travelto.equalsIgnoreCase(""))
                {

                    e1.setError("enter place");
                    e1.setFocusable(true);
                }
            }
        }
    }
}

```

```

else if(no_of_pass.equalsIgnoreCase(""))
{
e2.setError("enter no of passengers");
e2.setFocusable(true);
}
else
{
GeocodingLocation locationAddress = new GeocodingLocation();
locationAddress.getAddressFromLocation(travelto,
getApplicationContext(), new GeocoderHandler());

}
});
}
public void sendreq()
{
JsonReq jr= new JsonReq();
jr.json_response=(JsonResponse)SEND_REQUEST.this;
String q="/sentrequest?travelto="+
travelto+"&fromplace="+LocationService.place+"&noof="+no_of_pass+"&flati="+Location
Service.lati+"&flongi="+LocationService.logi+"&tlati="+tolatti+"&tlongi="+tolongi+"&uid
="+Login.logid;
q.replace(" ", "%20");
jr.execute(q);

}
private class GeocoderHandler extends Handler {
@Override
public void handleMessage(Message message) {
try
{
String locationAddress;
switch (message.what) {
case 1:
Bundle bundle = message.getData();
locationAddress = bundle.getString("address");
break;
default:
locationAddress = null;
}
String[] tmp=locationAddress.split("\\\\,");
Toast.makeText(getApplicationContext(), "check spelling"+tmp,
Toast.LENGTH_LONG).show();

```

```

        tolatti=tmp[0];
        tolongi=tmp[1];
        sendreq();
    }
    catch(Exception e)
    {
        Toast.makeText(getApplicationContext(), "check spelling"+e.toString(),
Toast.LENGTH_LONG).show();
    }
}
}
}
@Override
public boolean onCreateOptionsMenu(Menu menu) {
    // Inflate the menu; this adds items to the action bar if it is present.
    getMenuInflater().inflate(R.menu.send__request, menu);
    return true;
}

@Override
public void response(JSONObject jo) {
    // TODO Auto-generated method stub
    try{
        String status=jo.getString("status");
        Toast.makeText(getApplicationContext(), status, Toast.LENGTH_LONG).show();

        if(status.equalsIgnoreCase("success"))
        {
            Toast.makeText(getApplicationContext(), "sending request....",
Toast.LENGTH_LONG).show();
            Toast.makeText(getApplicationContext(), "success",
Toast.LENGTH_LONG).show();
            startActivity(new Intent(getApplicationContext(),Home.class));
        }
        else
        {
            Toast.makeText(getApplicationContext(), "Failed", Toast.LENGTH_LONG).show();
        }
    }
    catch(Exception e)
    {
        e.printStackTrace();
        Toast.makeText(getApplicationContext(), "exp : "+e, Toast.LENGTH_LONG).show();
    }
}
}
}
}

```

## **5. SYSTEM TESTING AND IMPLEMENTATION**

## **5.1 Introduction**

Software testing is defined as a process to check whether the actual results match the expected results and to ensure that the software system is error free. Software testing also helps to identify defects, gaps or missing requirements in contrary to the actual requirements. It can be done manually or using automated tools.

## **5.2 Implementation**

Implementation is the action that must follow any preliminary thinking in order for something to actually happen. Software/hardware implementations should always be designed with the end user in mind and the implementation process usually benefits from user involvement and support from managers and other top executives in the company. If users participate in the design and implementation of the system, ideally it will serve their business objectives more accurately and reflect their priorities and the ways in which they prefer to work.

## **5.3 Debugging**

Debugging is the process of finding and resolving defects or problems within a system that prevent the proper functioning of the system.

Different types of debugging methods used in this system are:

- **Unit Testing**  
The application was divided into smaller components and tested individually. Each code was executed separately to ensure accuracy.
- **Integration Testing**  
Each small component was integrated or combined into a module to ensure that each module works properly when put together. This was done to check connectivity between modules.
- **System Testing**

The system as a whole was tested by combining every module. This was to ensure that each process have a particular order. This was to ensure that the system does not crash while using.

- **Validation Testing**

In the registration fragment, validation is carried out to ensure user enters values in all the fields and the fields like full name, contact number, email and monthly income are validated individually. In the login fragment, incorrect inputs like username incorrect and password incorrect if used for login, then it was ensured that the appropriate error message was displayed. In the health data fragment, validation is carried out in fields like height, weight, hip, waist measurements, blood pressure, total cholesterol, HDL cholesterol, blood sugar, serum triglyceride individually. In activity tracker fragment, validation is carried out to ensure user enters values in the water intake field, energy spent field, diet field.

## **5.4 System Security**

Password encryption is used to protect each user's details.

## **5.5 Scope for Future Enhancement**

The current system is flexible and can be modified in the future.

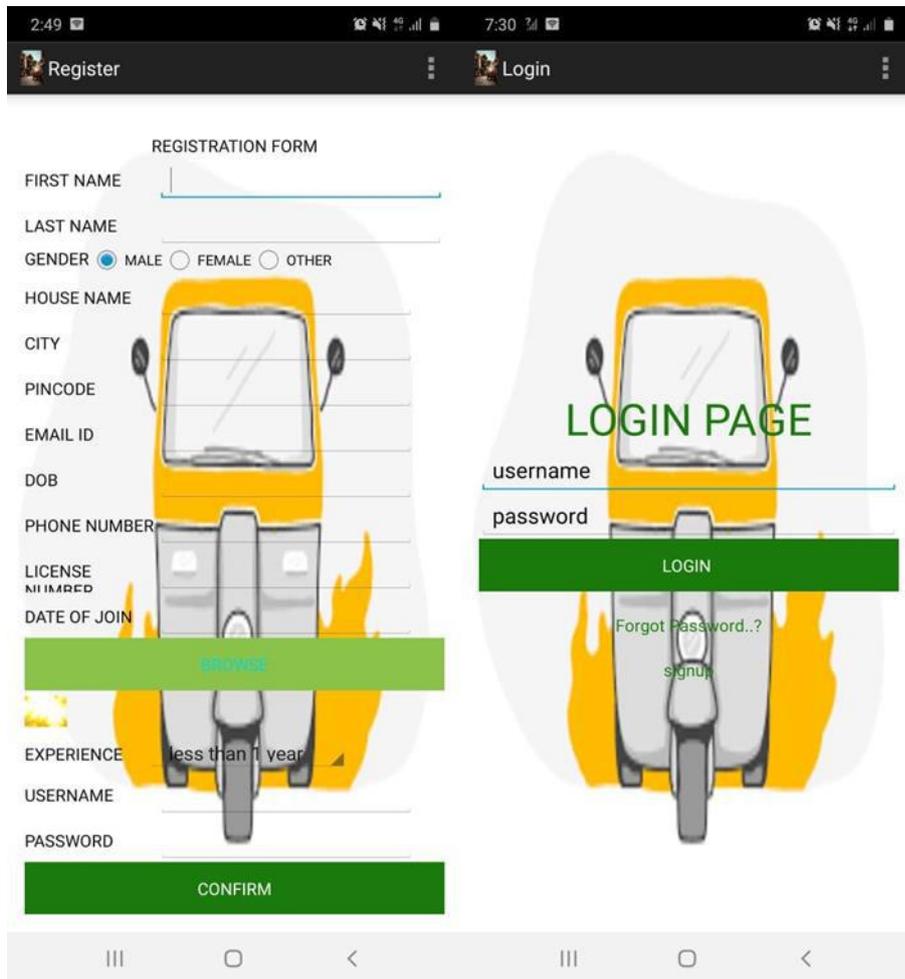
## **6. CONCLUSION**

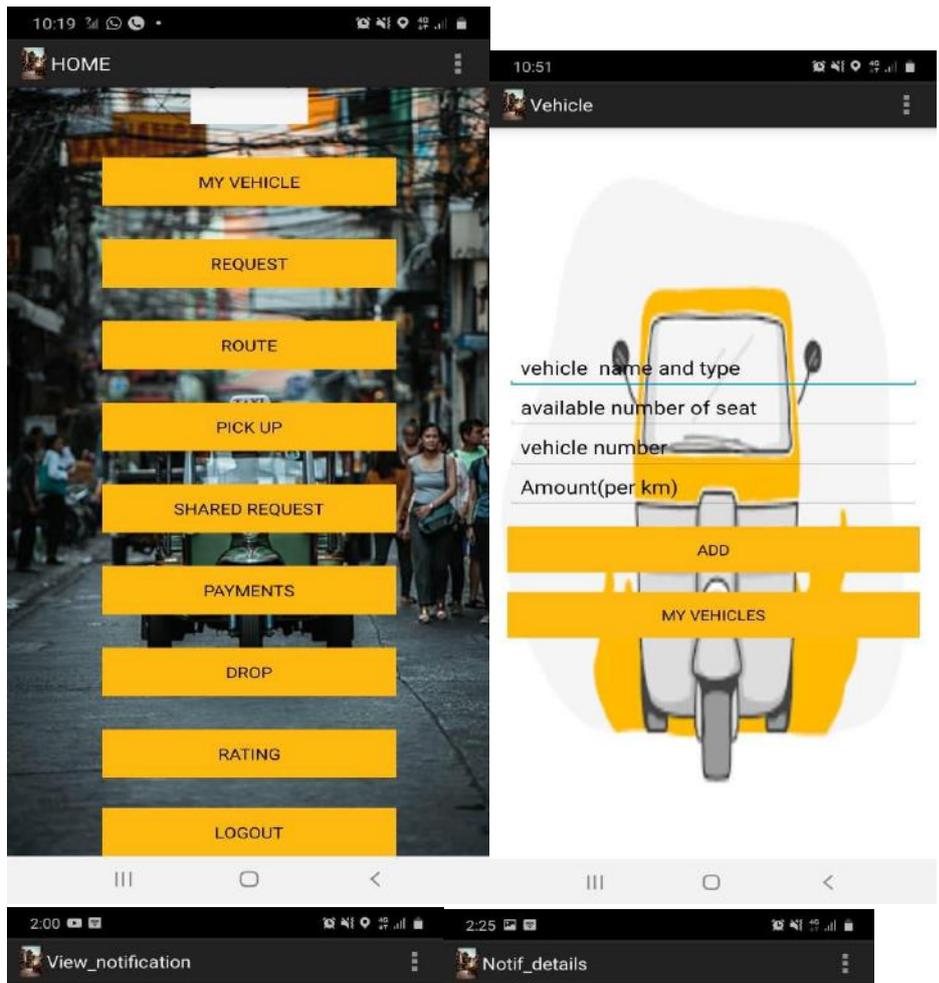
The software developed has fulfilled the necessary requirements as required by the user. It is ensured that all the programs are working properly in the “Tres wheel” application. The system is used to operate in a user-friendly manner. Proper documentation done from different areas provides smooth running of all the operations without difficulty. The system that has been developed in android studio is to improve the user interactivity. This project avoids errors. The system has achieved the objective of proving the safe and affordable rides to the passengers and can easily get the rides to its drivers. The project has been implemented and tested.

## **7. APPENDIX**

# DRIVER

## Interface

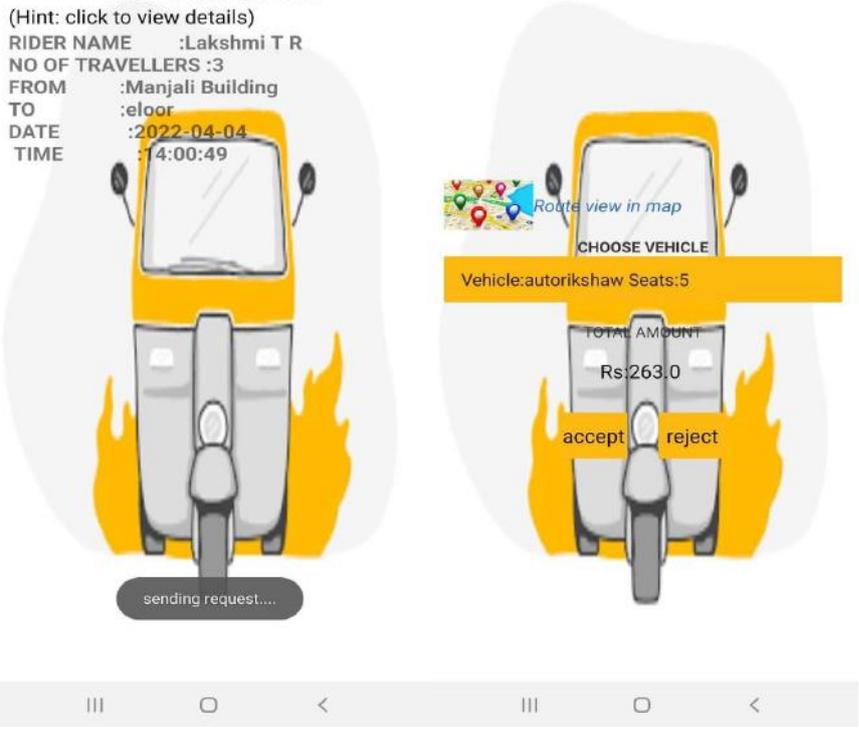


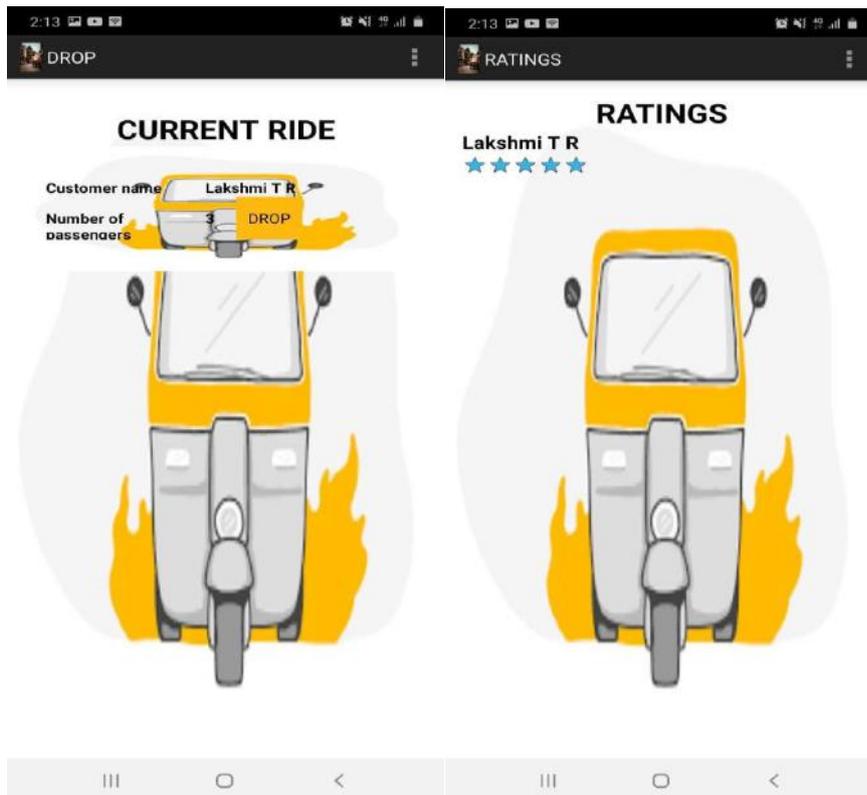
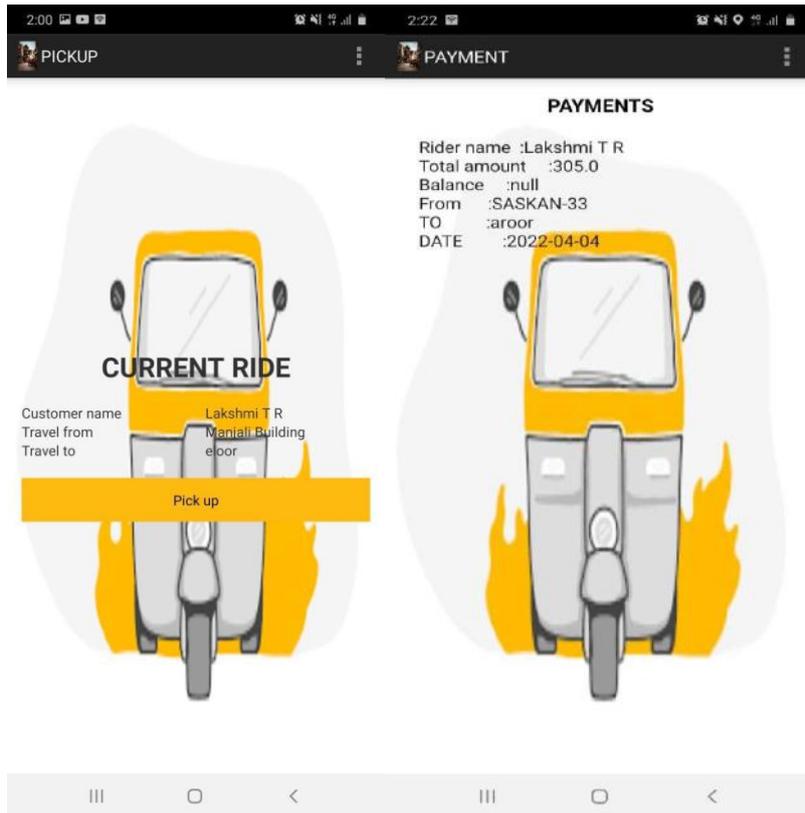


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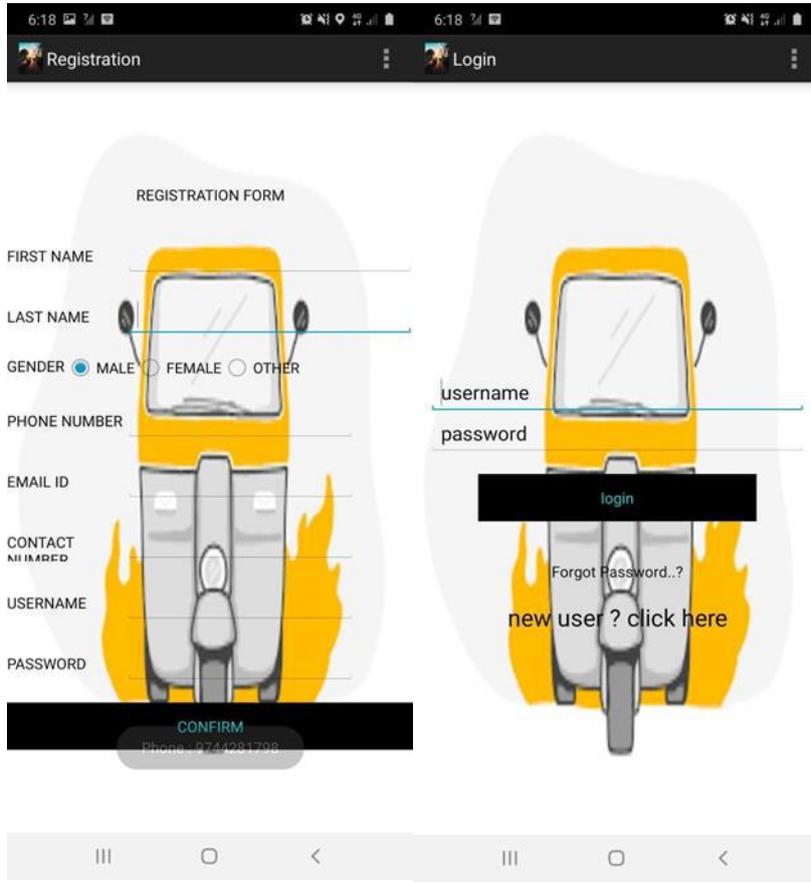
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 TO :eloor  
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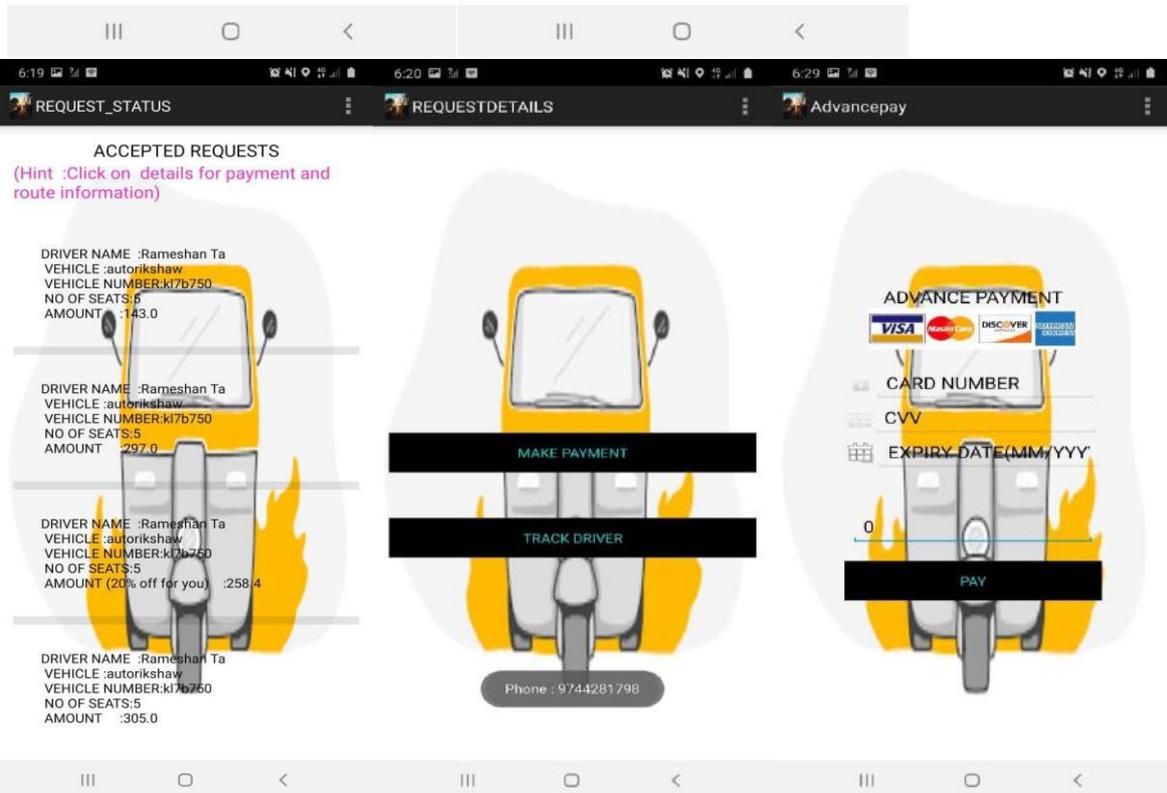
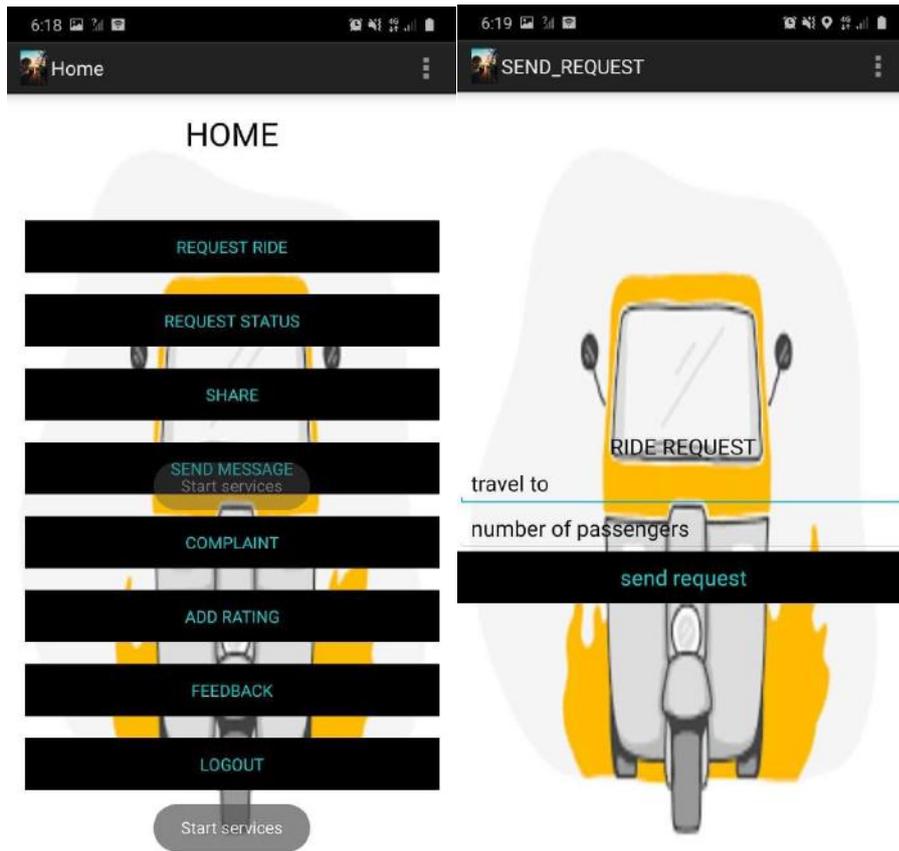


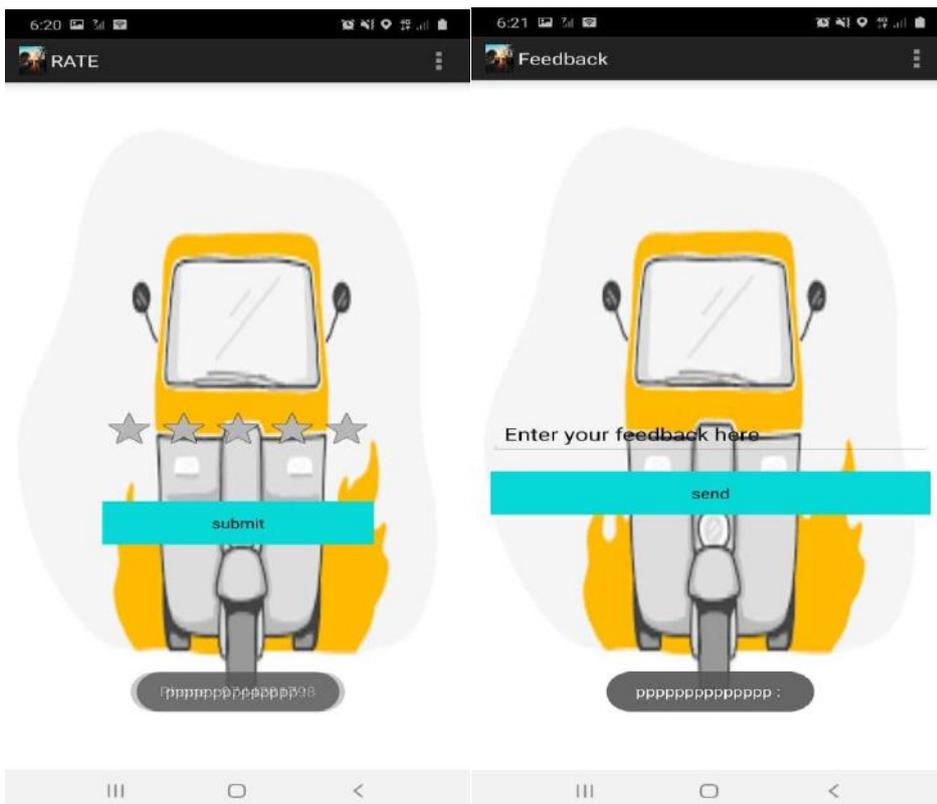
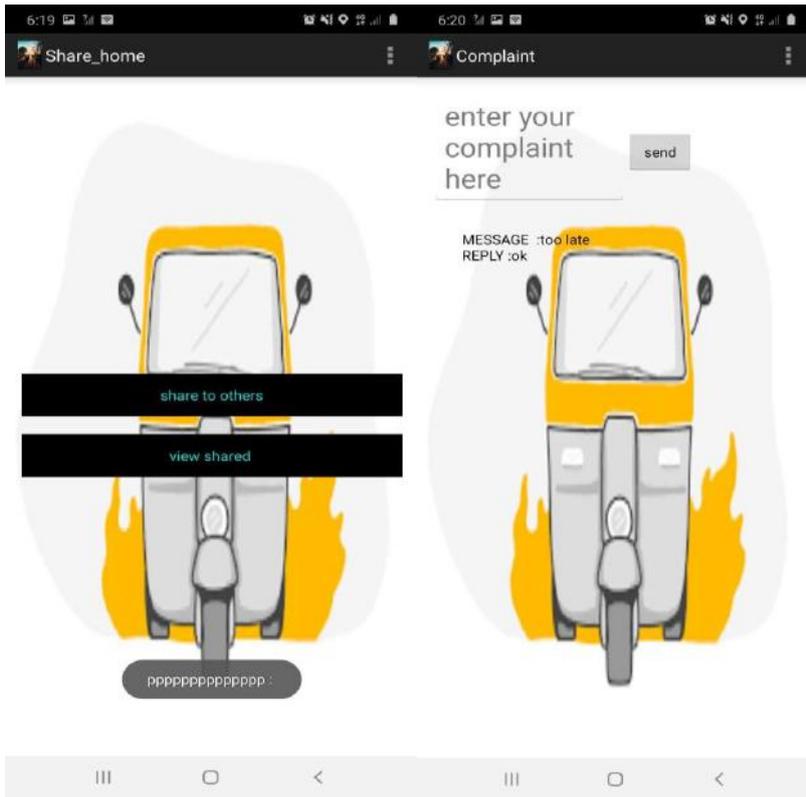


# RIDER

## Interface







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- <https://www.javatpoint.com/>
- <https://www.mysqltutorial.org/>

**ST. TERESA'S COLLEGE (AUTONOMOUS)  
ERNAKULAM**



**FINAL YEAR B.Sc PHYSICS  
PROJECT REPORT  
2021-22**

**STUDY OF NPN TRANSISTOR CHARACTERISTICS**

# ST. TERESA'S COLLEGE (AUTONOMOUS) ERNAKULAM



## CERTIFICATE

This is to certify that the project entitled '**STUDY OF NPN TRANSISTOR CHARACTERISTICS**' is an authentic work done by LAVANYA GIRISH, St. Teresa's College, Ernakulam, under my supervision at Department of Physics, St. Teresa's college partial requirements for the award of Degree of Bachelor Of science in Physics during the academic year 2021-22. The work presented in this dissertation has not been submitted for any other degree in this or any other university.

Supervising Guide  
Department

Dr. Sreeja V G  
Assistant Professor

Head of the  
Department

Dr. Priya Parvathy Ameen Jose  
Assistant Professor

**PLACE: Ernakulam**

**DATE: 06/05/2022**



**ST. TERESA'S COLLEGE (AUTONOMOUS)  
ERNAKULAM**

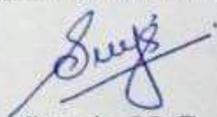


**B.Sc PHYSICS  
PROJECT REPORT**

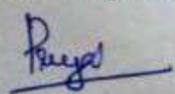
Name : LAVANYA GIRISH  
Register Number : AB19PHY009  
Year Of Work : 2021-2022

This is to certify that this Project work entitled '**STUDY OF NPN TRANSISTOR CHARACTERISTICS**' is an authentic work done by LAVANYA GIRISH.

Staff member in charge

  
Dr.Sreeja V G

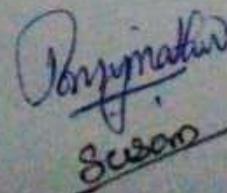
Head of the Department

  
Dr.Priya Parvathy Ameena Jose

Submitted for the university examination held at St. Teresa's College, Ernakulam .

Date:08/05/2021

EXAMINERS:

  
Suson

# **DECLARATION**

I, **LAVANYA GIRISH**, final year B.sc Physics student, Department of Physics, St. Teresa's College, Ernakulam do hereby declare that the project work entitled '**STUDY OF NPN TRANSISITOR CHARACTERISTICS**' has been originally carried out under the guidance and supervision of Dr.Sreeja V G, Assistant Professor, Department of Physics, St.Teresa's College (Autonomous), Ernakulam in partial fulfilment for the award of the degree of Bachelor of Physics.I further declare that this project is not partially or wholly submitted for any other purpose and the data is included in the project is collected from various sources and true to the best of my knowledge.

PLACE: Ernakulam

DATE: 06/05/2022

# ABSTRACT

The transistor is without a doubt one of the most important contributions to the world of electrical components. Many firms have begun large-scale programmes to create transistor circuits, and practical applications will undoubtedly become more common in the near future.

This project “**Study of NPN Transistor Characteristics**” discusses the input and output characteristics of a NPN transistor in all the three configuration- CE, CB and CC.

# **ACKNOWLEDGEMENT**

I thank Almighty for His abundant blessing throughout this journey and to make this project a successful one. I owe a deep sense of gratitude to our project guide Dr.Sreeja V G for her immense support and valuable ideas that helped us to make this project. I would like to express my sincere gratitude to the head of the department Dr. Priya Parvathy Ameena Jose for her esteemed guidance and encouragement. I would also like to thank and express my heartfelt acknowledgement to our teachers, lab assistants and all the non-teaching staff who have always been there to help us throughout. A heartfelt thanks to my group members for being the pillar of support. Last, thanking everyone who has helped and encouraged us to make this project a reality.

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# CHAPTER - 1

## AN INTRODUCTION TO TRANSISTORS

### INTRODUCTION

A transistor is a type of semiconductor device that can be used to conduct as well as insulate electric current or voltage. It can act as both a switch and amplifier by providing a small signal voltage. A voltage or current applied to one pair of the transistor's terminals changes the current through another pair of terminals. They are the key components in most modern devices.

Transistors can be classified into :

- ❖ Bipolar junction transistors ( BJTs )
- ❖ Field-Effect Transistors ( FETs )
- ❖ Insulated Gate Bipolar Transistors ( IGBTs )

Bipolar junction transistors are of two types :

- ❖ npn Transistor
- ❖ pnp Transistor

Field effect transistors are of two types :

- ❖ JFET
- ❖ MOSFET

## 1.1 BIPOLAR JUNCTION TRANSISTORS

A bipolar junction transistor or BJT is a three terminal semiconductor device consisting of two p-n junction diodes that can amplify signals. It uses both electrons and holes as charge carriers.

A typical transistor has three terminals that help to make connections to external circuits and carry the current. The three terminals are:

1. Emitter
2. Base
3. Collector

### **Emitter :**

The emitter section supplies the charge. Hence it is heavily doped so that it can inject a large number of charge carriers into the base. The size of the emitter is always greater than the base but less than the collector. It is the negative lead of the transistor.

### **Base :**

The base is the middle layer. The size of the base is very small. It is less than the emitter and collector. The size is kept small so that the charge that is coming from the emitter and entering the base do not recombine in the base region and is transferred to the collector region.

The base is lightly doped and it is used to activate the transistor.

### **Collector :**

The function of the collector is to collect the charge carriers. It is moderately doped and the size is slightly large when compared to the emitter and base. It is because all the charges coming from the emitter recombine at

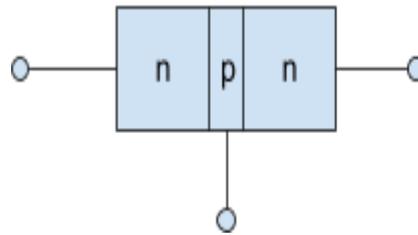
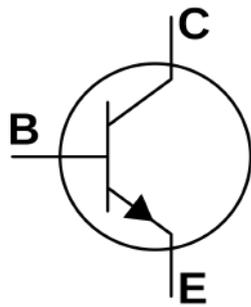
base and heat is released in this process. Hence the collector terminal must be large so that it can dissipate the heat and the device is not burnt.

Bipolar junction transistors can be classified into two types:

- NPN Transistor
- PNP Transistor

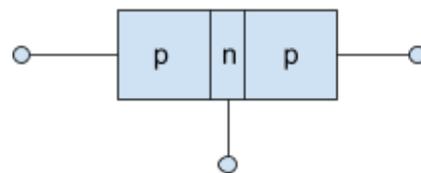
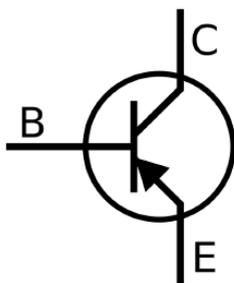
### 1.1.1 NPN Transistor

When a P type semiconductor layer is sandwiched between two N-type semiconductor layers the transistor is said to be a NPN transistor.



### 1.1.2 PNP Transistor

When an N-type semiconductor layer is sandwiched between two P-type semiconductor layers the transistor is said to be a PNP transistor.



## 1.2 WORKING OF A TRANSISTOR

The transistor mainly works in three regions:

### 1. Active Region :-

When the emitter junction is forward biased and the collector junction is reverse bias the transistor is said to be in active mode. This region is used for amplification purpose. In the active region collector current is  $\beta$  times the base current i.e,

$$I_c = \beta I_B$$

Where,

$I_c$  = Collector current

$\beta$  = current amplification factor

$I_B$  = base current

### 2. Saturation region :-

When both the emitter and collector junctions are forward biased the transistor will work in the saturation region. In this region the transistor is used for switching operation. The transistor act as an ON switch. In the saturation region

$$I_c = I_E$$

Where,

$I_c$  = Collector current

$I_E$  = Emitter current

### 3. Cut-off region :-

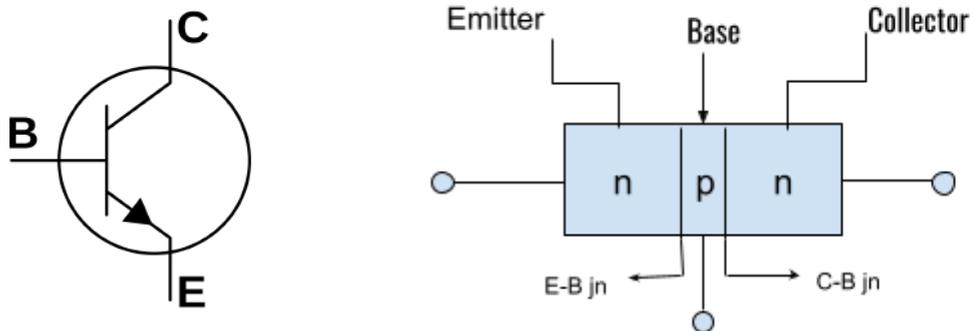
The transistor works in the Cut-off region when both the emitter and collector are reverse biased. Therefore,

$$I_E = I_c = I_B$$

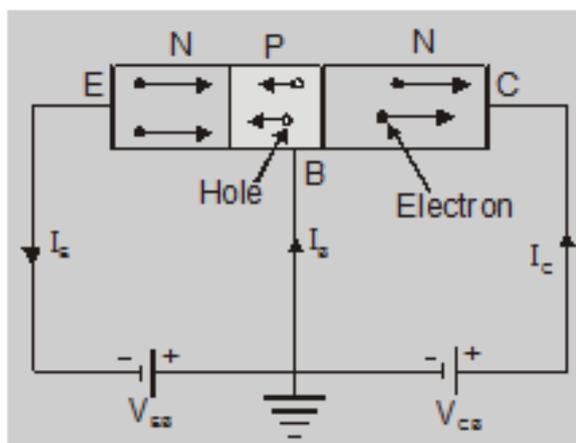
#### 4. **Reverse Active** :-

In this the emitter base junction is reverse biased and collector base junction is forward biased.

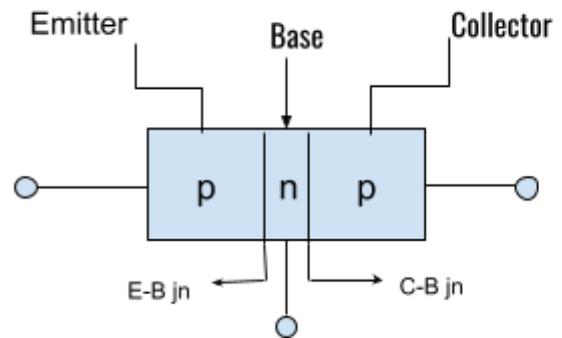
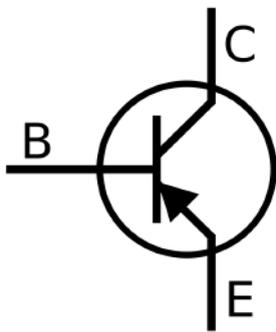
### NPN Transistor



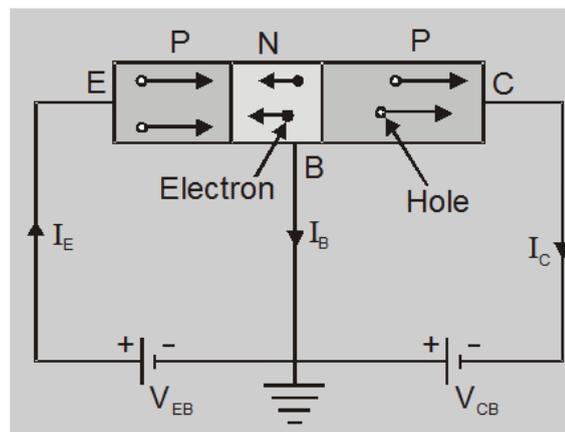
Since the Emitter-Base junction in an npn transistor is forward biased, a lot of electrons from the emitter enter the base region. Base is lightly doped with p-type impurities ( Holes ). Due to this there is very less electron-hole recombination i.e, very less electrons combine to constitute the base current ( $I_B$ ). The remaining electrons cross over the collector region to constitute the collector current ( $I_C$ ).



# PNP Transistor



In a pnp transistor the emitter base junction is forward biased and collector base junction is reverse biased. Due to this a large number of holes flow from the emitter to the base and the electrons from base to the emitter region. The base is lightly doped with n-type impurities and hence number of electrons in base is very small. Due to this electron-hole recombination is less and a very few holes combine with the electrons to create the base current ( $I_B$ ). The remaining holes cross over the collector region to create the collector current ( $I_C$ ).



## 1.3 ADVANTAGES OF USING TRANSISTORS

Transistors have been proven as a very important invention in science. It has many uses and advantages:

- It is small in size and is very cost-efficient.
- It needs very low voltage to function.
- It has a long life and requires no power to operate.
- A single integrated circuit can be developed using the transistor.
- Current switches fast in the terminals.

## 1.4 LIMITATIONS OF TRANSISTORS

Even though transistors are extremely efficient, there are some limitations to its uses:

- Transistors get damaged very easily due to changes in electrical and temperature conditions.
- They lack higher electron mobility.
- They can get affected by radiation.

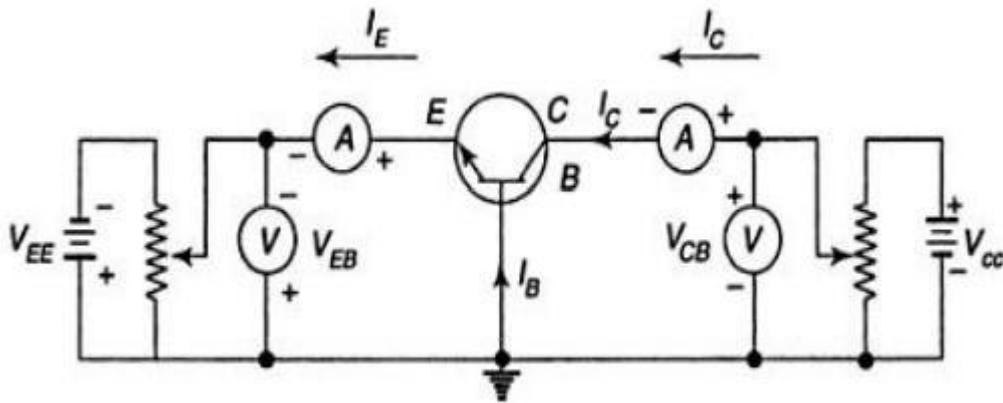
## 1.5 TRANSISTOR CONFIGURATIONS

Three types of configurations in a transistor are :

- Common Base configuration ( CB )
- Common Emitter configuration ( CE )
- Common Collector configuration ( CC )

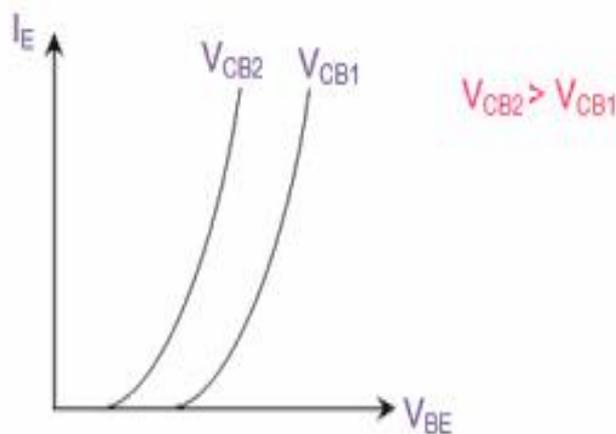
### 1.5.1 COMMON BASE CONFIGURATION

In the Common base configuration ( CB ) the Base is grounded and used as a common terminal for both input and output. It is also known as grounded base configuration. Here, the emitter is the input terminal and the collector is the output terminal.



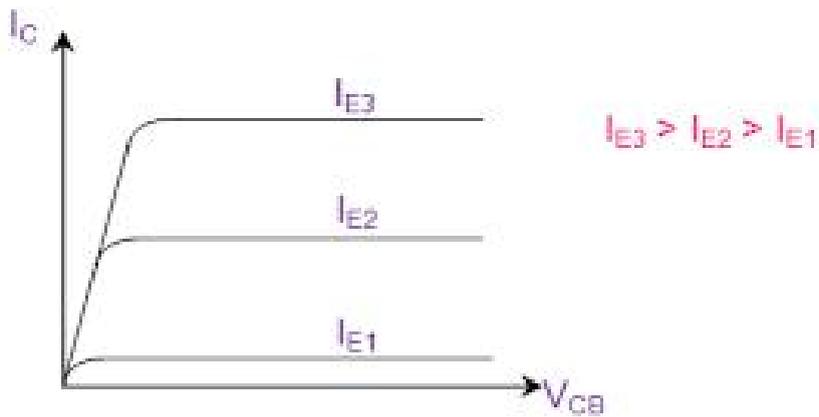
## Input Characteristics

It is defined as the characteristic curve drawn between the input voltage to input current keeping output voltage constant. To determine the input voltage the collector base voltage ( $V_{CB}$ ) is kept constant at zero and the emitter current  $I_E$  is increased from zero by increasing  $V_{EB}$ . This is repeated for higher fixed values of  $V_{CB}$



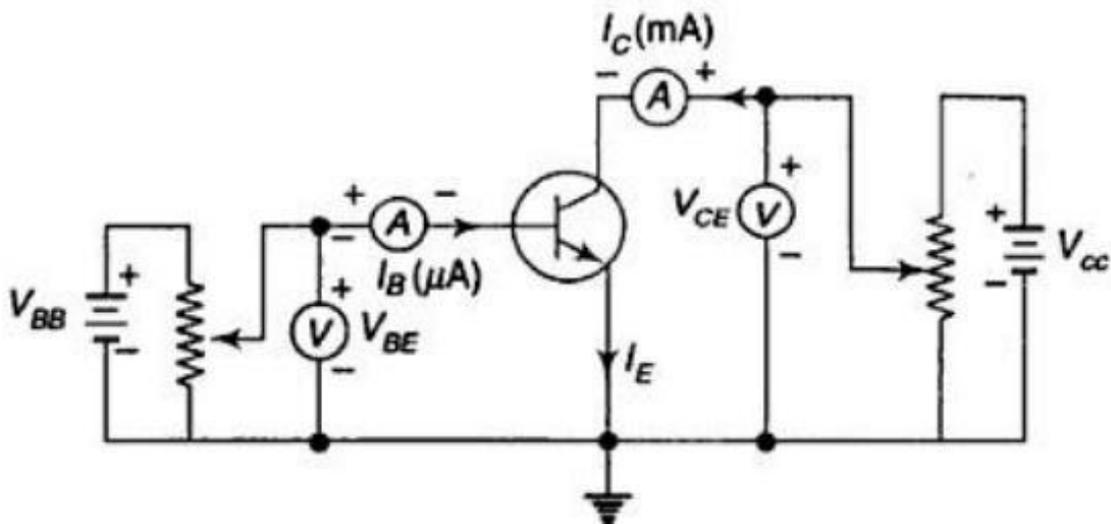
## Output characteristics

It is defined as the characteristic curve drawn between output current and output voltage keeping input current constant. To determine the output characteristics the emitter current is kept constant at a particular value and the collector current ( $I_C$ ) is increased from zero to higher values by increasing  $V_{CB}$ . This is repeated for higher fixed values of  $I_E$ . It is seen that for a constant value of  $I_E$ ,  $I_C$  is independent of  $V_{CB}$  and the curves are parallel to X-axis of  $V_{CB}$



## 1.5.2 COMMON EMITTER CONFIGURATION

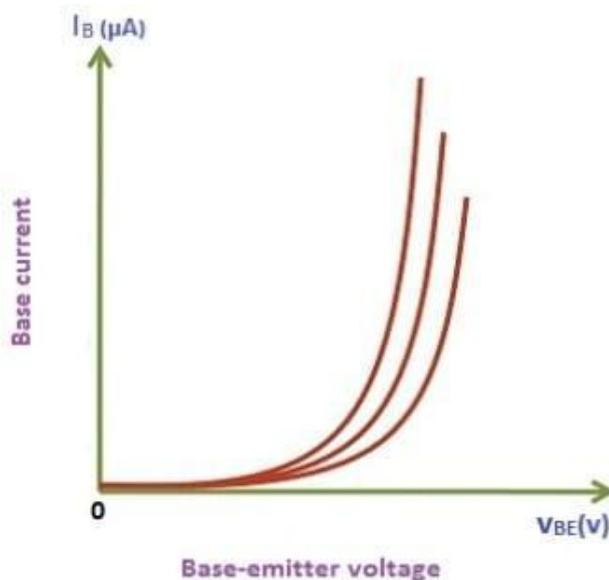
In common Emitter configuration (CE) the emitter is grounded and is a common terminal for both the input and output. It is also known as grounded emitter configuration. Here base is used as the input terminal and collector as the output terminal.



## Input Characteristics

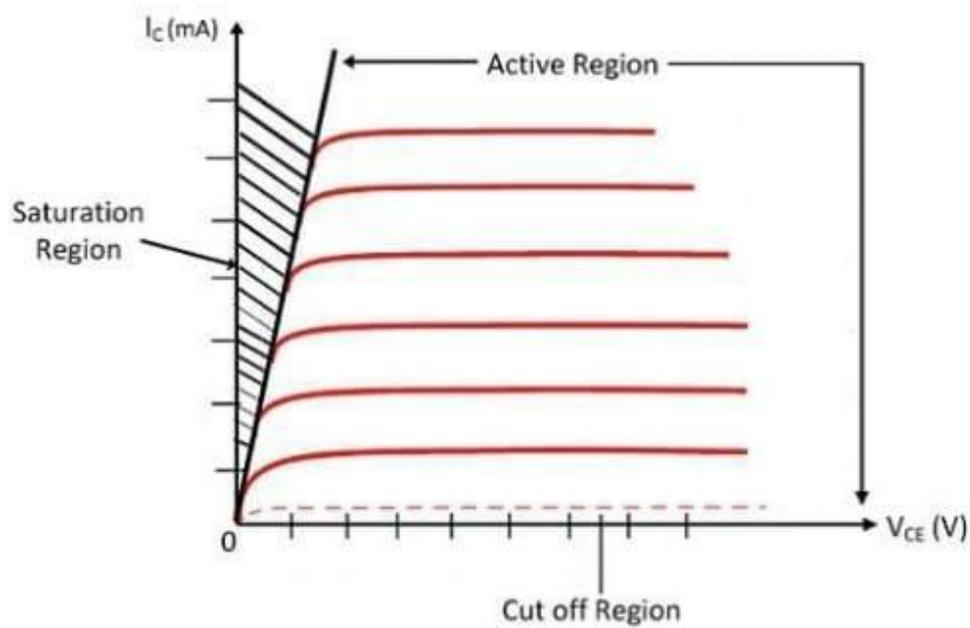
It is defined as the curve drawn between the input voltage and the input current at constant output voltage.

To determine the input characteristics the collector base voltage is kept constant  $V_{CB}$  at zero and base current  $I_B$  is increased from zero by increasing  $V_{BE}$ . This is repeated for higher values of  $V_{CE}$ .



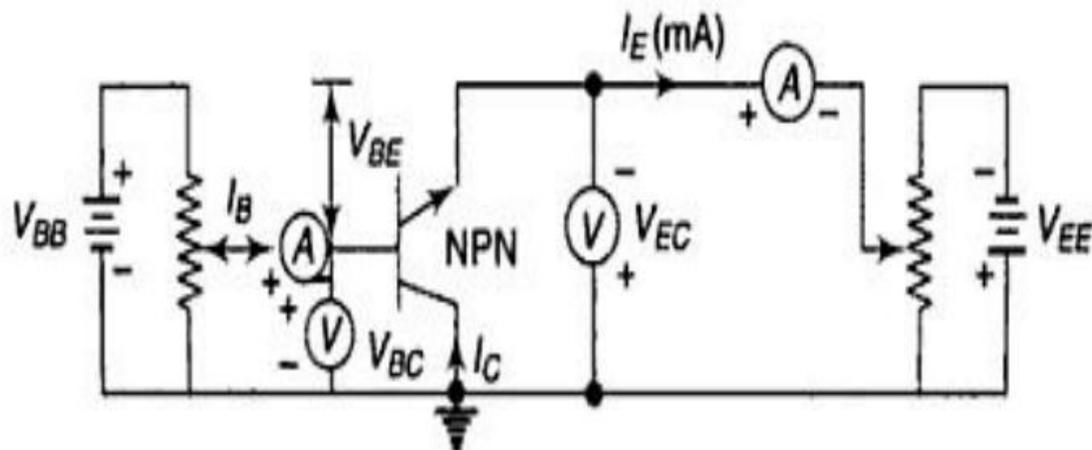
## Output Characteristics

It is defined as the characteristic curve drawn between the output voltage to the output current at constant input current. To determine output characteristics, the base current  $I_B$  is kept constant at zero and collector current  $I_C$  is increased from zero by increasing  $V_{CE}$ . This is repeated for higher fixed values of  $I_B$ .



### 1.5.3 COMMON COLLECTOR CONFIGURATION

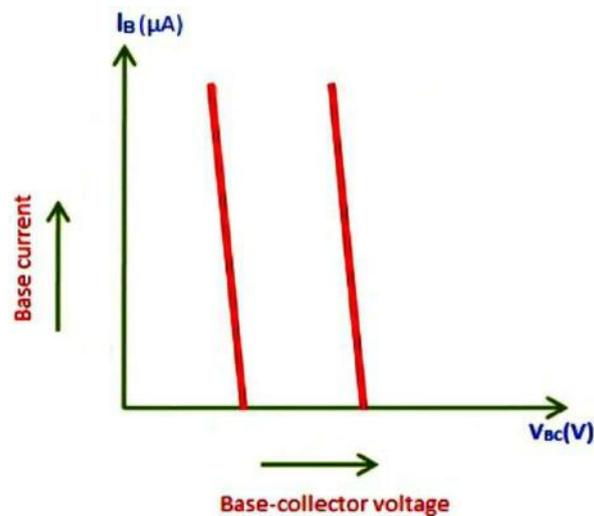
In a common collector configuration the collector is grounded and is used as the common terminal for both the input and the output terminal. It is also known as grounded collector configuration. Here the base is the input terminal and the emitter is the output terminal.



## Input Characteristics

It is defined as the characteristic curve drawn between input voltage to input current whereas output voltage is constant.

To determine input characteristics, the emitter base voltage  $V_{EB}$  is kept constant at zero and base current  $I_B$  is increased from zero by increasing  $V_{BC}$ . This is repeated for higher fixed values of  $V_{CE}$ .

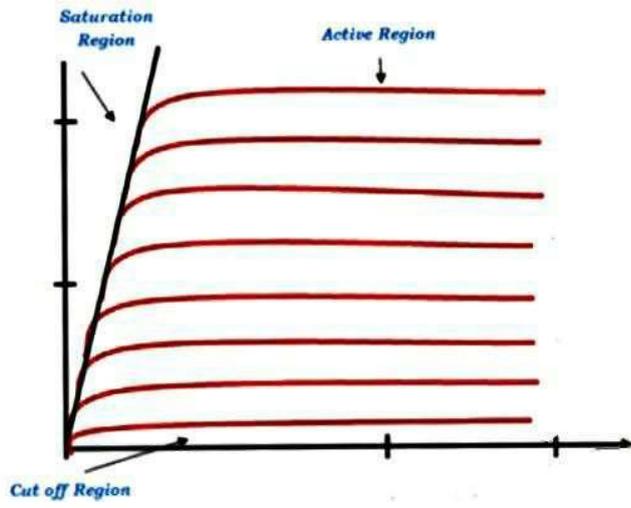


## Output characteristics

It is defined as the characteristic curve drawn between output voltage to output current whereas input current is constant.

To determine output characteristics, the base current  $I_B$  is kept constant at zero and emitter current  $I_E$  is increased from zero by increasing  $V_{EC}$ . This is repeated for higher fixed values of  $I_B$ .

From the characteristic it is seen that for a constant value of  $I_B$ ,  $I_E$  is independent of  $V_{EB}$  and the curves are parallel to the axis of  $V_{EC}$ .



## CONCLUSION

Thus, a transistor is an electronic device made of three layers of semiconductor material that can act as an insulator and a conductor. It is an essential part of many technological advances and devices. This chapter helps to give an idea about the basic theory of transistors. It contains a quick view on the construction, working, types of transistors (nnp and pnp transistors) and advantages and limitations. It also covers the three configurations of transistors - Common Emitter Configuration (CE), Common Base Configuration (CB) and Common Collector Configuration (CC) and their respective input and output characteristics.

# CHAPTER 2

## BASIC REQUIREMENTS

( Details of Components and Devices )

### INTRODUCTION

The experiment works with a npn transistor in all the three configuration i.e. CE, CB and CC configuration, to find the input and output characteristics. The basic devices used are transistor, voltmeter, ammeter, rheostat, battery eliminator, bread board and connection wires. This chapter contains the details regarding the components and devices used for the experiments.

### 2.1. COMPONENTS AND DEVICES

#### (i) Transistor BC 107

The BC107 is a small single NPN Transistor available in TO-18 metal can package. These transistors are age old and have been used in low noise and low signal designs. Today a lot of new transistors have come as replacement for BC107, but still the transistor can be found in the market for its legacy.



The **BC107** is a low signal NPN which is known for its low noise operations making it famously used in signal processing circuits and television receivers.

The transistor is still available in the market due to its legacy but you will find better modern transistors as replacement for BC107.

Applications:

- Driver Modules like Relay Driver, LED driver etc..
- Amplifier modules like Audio amplifiers, signal Amplifier etc..
- Darlington pair

### (ii) Voltmeter:

It is an instrument that measures voltages of either direct or alternating electric current on a scale usually graduated in volts, millivolts (0.001 volt), or kilovolts (1,000 volts). Many voltmeters are digital, giving readings as numerical displays.



Analog voltmeters move a pointer across a scale in proportion to the voltage measured and can be built from a galvanometer and series resistor. Meters using amplifiers can measure tiny voltages of microvolts or less. Digital voltmeters give a numerical display of voltage by use of an analog-to-digital converter.

### (iii) Ammeter

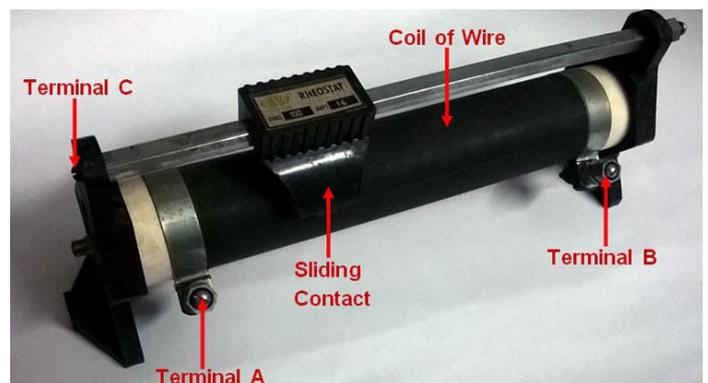
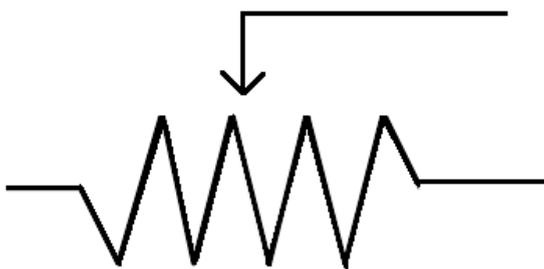
It is an instrument for measuring either direct or alternating electric current, in amperes. An ammeter can measure a wide range of current values because

at high values only a small portion of the current is directed through the meter mechanism; a shunt in parallel with the meter carries the major portion.



### (iii) Rheostat

A rheostat is defined as variable resistor which is used for controlling the flow of electric current either by increasing or decreasing the resistance. The term rheostat was coined by the English scientist Sir Charles Wheatstone and is derived from the Greek word “rheos” and “statis” which means current controlling device.



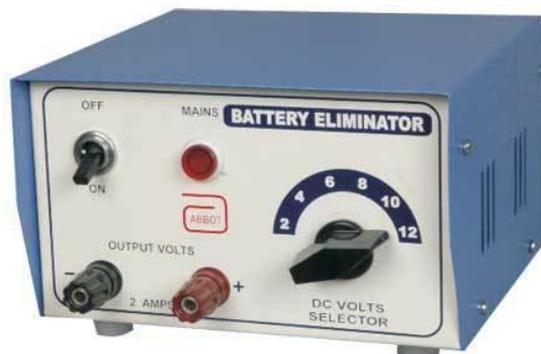
For any given rheostat, we can change its resistance. We know that resistance is dependent on three factors:

- Length
- Areas of cross-section
- Type

In order to change the resistance of the rheostat, the effective length needs to be changed with the help of sliding contact. The effective length is defined as the length between the fixed terminal and the position of the sliding terminal. As the effective length changes, the resistance of the rheostat changes.

(iv) **Battery Eliminator:**

A battery eliminator is a device powered by an electrical source other than a battery, which then converts the source to a suitable DC voltage that may be used by a second device designed to be powered by batteries. A battery eliminator eliminates the need to replace batteries but may remove the advantage of portability. A battery eliminator is also effective in replacing obsolete battery designs.



## 2.2 PROCEDURE

Connections are made as shown in the circuit diagrams. The rheostat Rh1 is used to vary base voltage (input voltage)  $V_{BE}$  and it is read from voltmeter V1. The base current (input current)  $I_B$  is measured using a microammeter ( $\mu A$ ). The collector voltage (output voltage)  $V_{CE}$  is varied using the rheostat Rh2 and readings are noted from voltmeter V2. The collector current (output current)  $I_C$  is measured by the milliammeter (mA).

## CONCLUSION

The chapter briefs the details, uses and types of various components and devices used in the experiment to find out the input and output characteristics of the transistor. The experiment is, thus, done with the npn transistor - Transistor BC 107, ammeter - to measure the current, voltmeter - to measure the voltage drop, rheostat - used as a variable resistance, battery eliminator - for supply of voltage, bread board and connecting wires.

## CHAPTER-3

# CHARACTERISTICS OF COMMON EMITTER CONFIGURATION

### INTRODUCTION

In this chapter we try to find the input and output characteristics of common emitter configuration experimentally and compare it with the theoretical values.

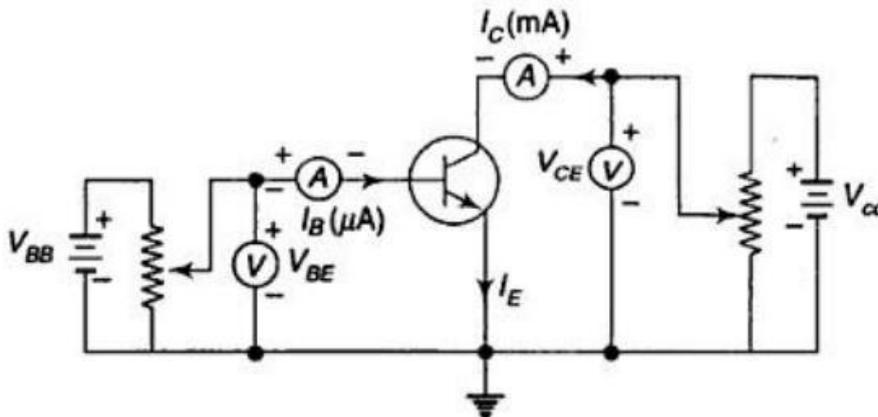
#### Aim

To study the input and output characteristics of a transistor in common emitter (CE) configuration.

#### Apparatus

Transistor BC107, Breadboard, Rheostat, Analogue Ammeter, Analogue voltmeter

#### Circuit diagram



### 3.1 Procedure

a) To find input characteristics:

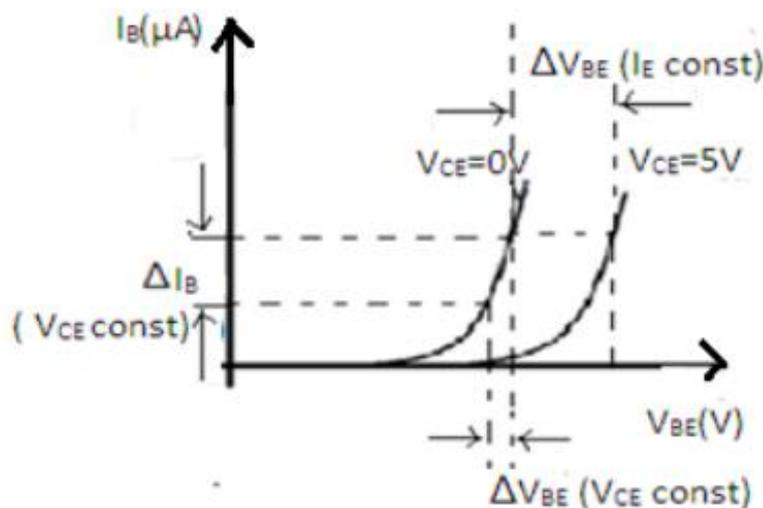
Connect the circuit diagram as shown in the circuit diagram. Keep output voltage  $V_{CE}=0V$  by varying  $V_{CC}$ . Varying  $V_{BB}$  gradually, note down the base current  $I_B$  and base emitter voltage  $V_{BE}$ . Step size is not fixed because of linear curve. Initially vary  $V_{BB}$  in steps of 0.1 V. Once the current starts increasing vary  $V_{BB}$  in steps of 1V up to 12 V. Repeat the above procedure.

b) To find output characteristics:

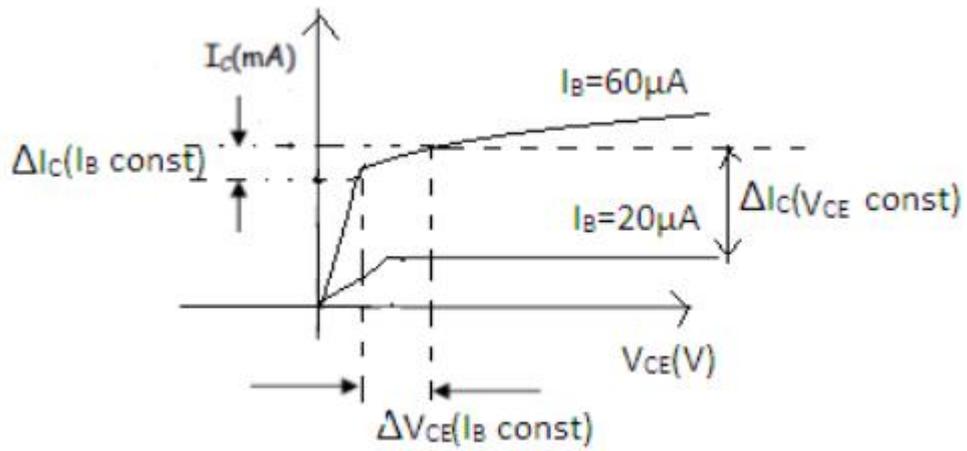
Connect the circuit diagram as shown in the figure. Keep base current ( $I_B$ ) constant by varying the rheostat. Varying the rheostat gradually note down collector current ( $I_C$ ) and collector emitter voltage ( $V_{CE}$ ) Repeat the above experiment.

Plot the graph of input characteristics by taking  $V_{BE}$  on X axis and  $I_B$  on Y axis at a constant  $V_{CE}$  as a constant parameter. Plot the graph of output characteristics by taking  $V_{CE}$  on X axis and taking  $I_C$  on Y axis taking  $I_B$  as a constant parameter.

### Graph



Input Characteristics



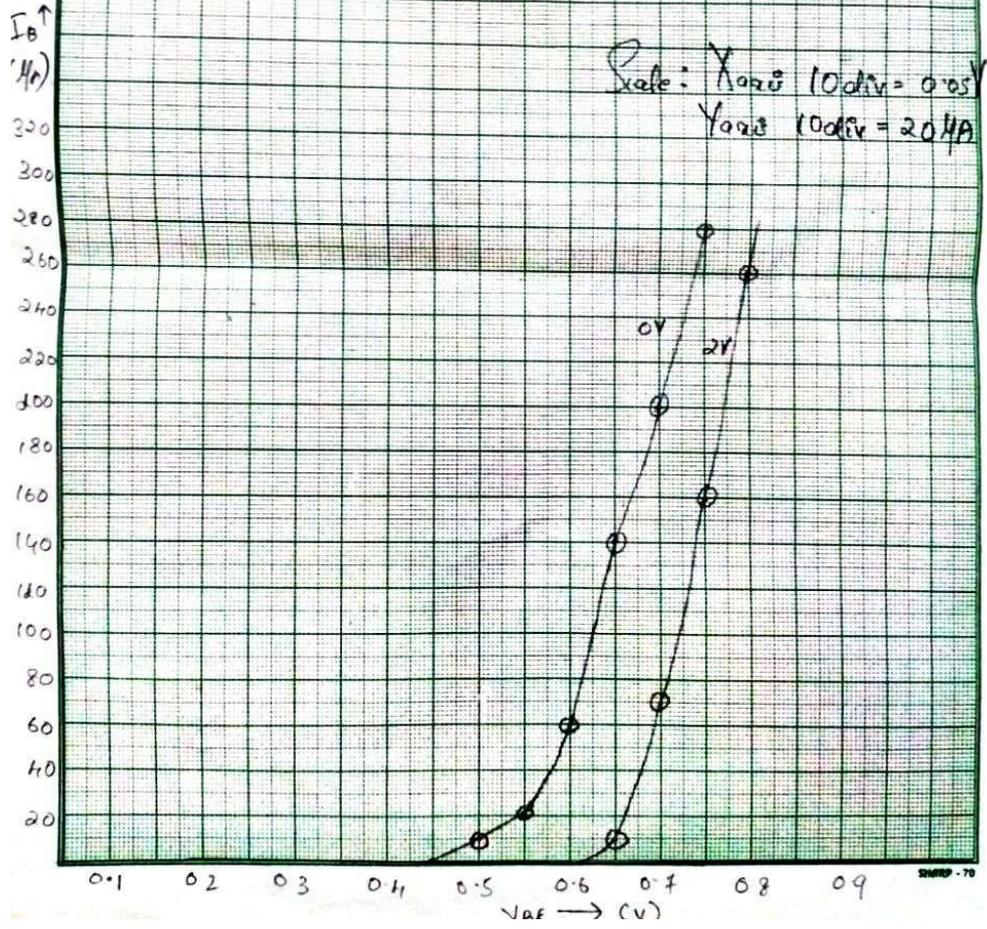
Output Characteristics

### 3.2 Observations

#### INPUT CHARACTERISTICS

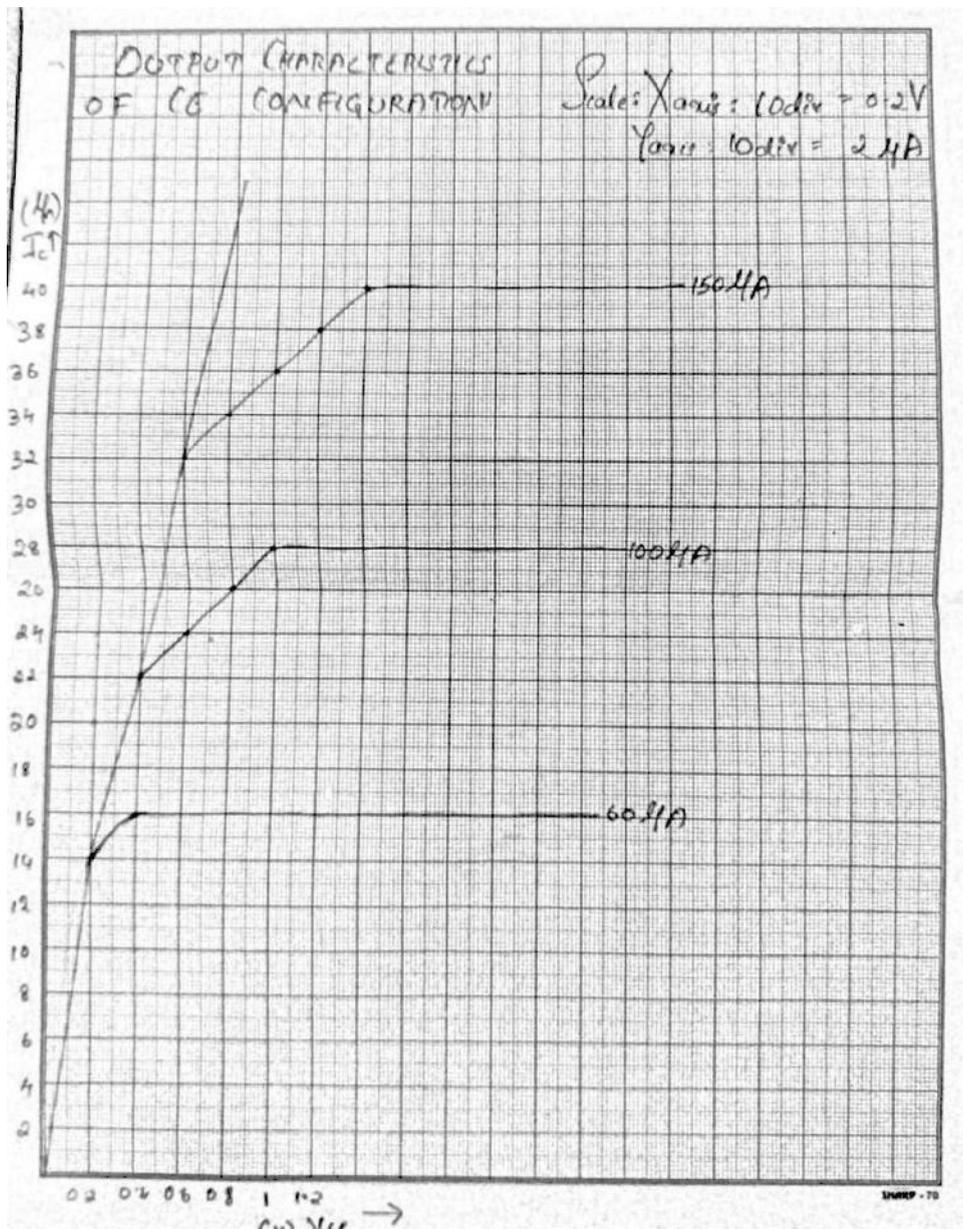
$V_{CE} = 0V$		$V_{CE} = 2V$	
$V_{BE}(V)$	$I_B(\mu A)$	$V_{BE}(V)$	$I_B(\mu A)$
0.5	10	0.65	10
0.55	20	0.7	70
0.6	60	0.75	160
0.65	140	0.8	260
0.7	200	0.85	370
0.75	280	0.9	460

# INPUT CHARACTERISTICS OF CE CONFIGURATION



## OUTPUT CHARACTERISTICS

$I_B=0 \mu\text{A}$		$I_B=100 \mu\text{A}$		$I_B=150 \mu\text{A}$	
$V_{CE}$ (V)	$I_C$ (mA)	$V_{CE}$ (V)	$I_C$ (mA)	$V_{CE}$ (V)	$I_C$ (mA)
0	0	0	0	0	0
0.2	14	0.2	20	0.2	24
0.4	16	0.4	22	0.4	28
0.6	16	0.6	24	0.6	32
0.8	16	0.8	26	0.8	34
1	16	1	28	1	36
1.2	16	1.2	28	1.2	38
1.4	16	1.4	28	1.4	40
1.6	16	1.6	28	1.6	40
1.8	16	1.8	28	1.8	40



### Calculations from the Graph

To obtain input resistance find  $\Delta V_{BE}$  and  $\Delta I_B$

For a constant  $V_{CE}$  on one of the input characteristics;

$$\text{Input impedance} = \Delta V_{BE} / \Delta I_B = (0.6 - 0.5) / (60 - 10)$$

$$= 0.1 / 50 = 0.002 \Omega$$

$$\text{Reverse voltage gain} = \Delta V_{EB} / \Delta V_{CE} = (0.6 - 0.5) / (0.4 - 0.2)$$

$$= 0.1 / 0.2 = 0.5$$

To obtain output resistance find  $\Delta I_c / \Delta V_{CB}$  at a constant  $I_B$ .

$$\begin{aligned}\text{Forward current gain} &= \Delta I_c / \Delta I_B = (16 - 14) / (20 - 10) \\ &= 2 / 10 = 0.2\end{aligned}$$

### 3.3 Results

- a. The input resistance =  $0.002 \Omega$
- b. The reverse voltage gain = 0.5
- c. The forward current gain = 0.2

### CONCLUSIONS

In this Chapter we studied the input and output characteristics of an NPN transistor in CE configuration. We have also included the observations and graphs of the same.



## 4.1 Procedure

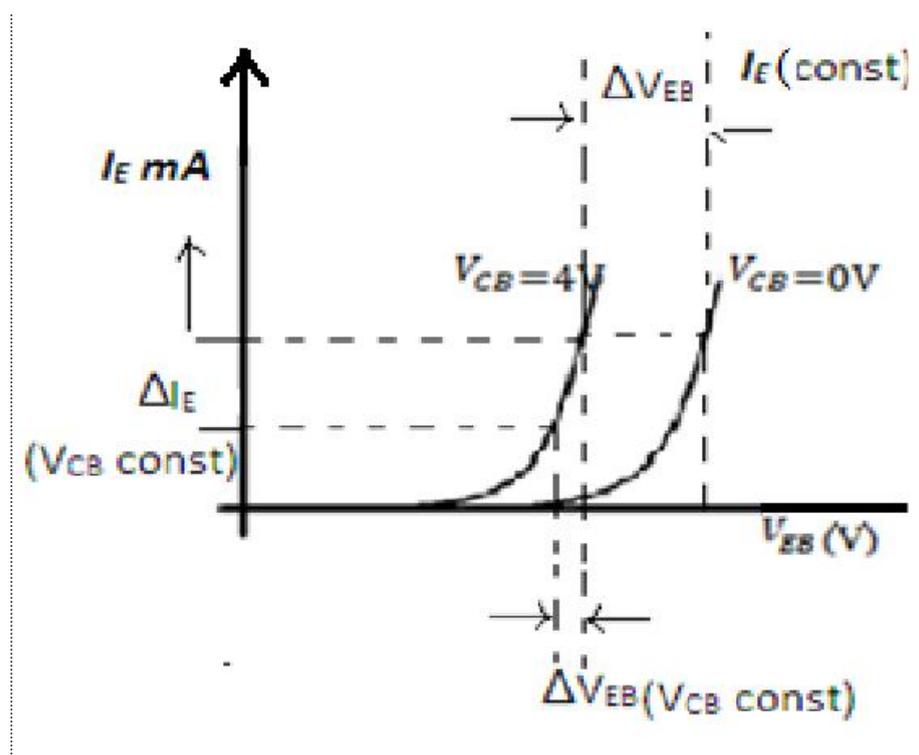
a) To find Input Characteristics:

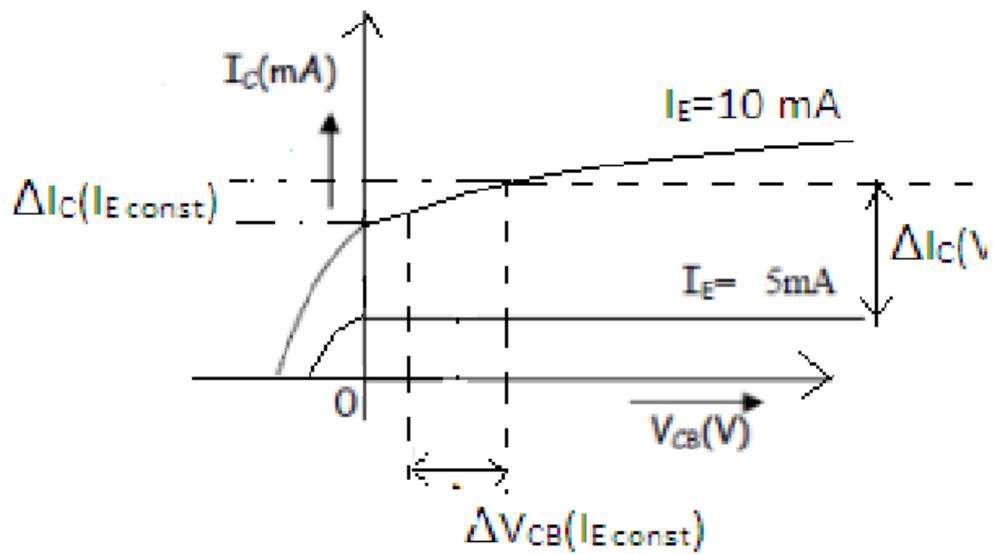
Connect the circuit as shown in the circuit diagram. Keep output voltage  $V_{CB}$  constant by varying rheostat. Varying rheostat gradually, note down emitter current ( $I_E$ ) and emitter-base voltage ( $V_{EB}$ ). Step size is not fixed because of the nonlinear curve. Repeat above procedure for different constant value  $V_{CB}$

b) To find Output Characteristics:

Connect the circuit as shown in the circuit diagram. Keep emitter current ( $I_E$ ) by varying resistance in rheostat and note down collector current  $I_C$  and collector-base voltage ( $V_{CB}$ ). Repeat the procedure for different constant values of  $I_E$  Plot the input characteristics for different values of  $V_{CB}$  by taking  $V_{EB}$  on X-axis and  $I_E$  on Y-axis taking  $V_{CB}$  as constant parameter. Plot the output characteristics by taking  $V_{CB}$  on X-axis and  $I_C$  on Y-axis taking  $I_E$  as a constant parameter.

## Graph



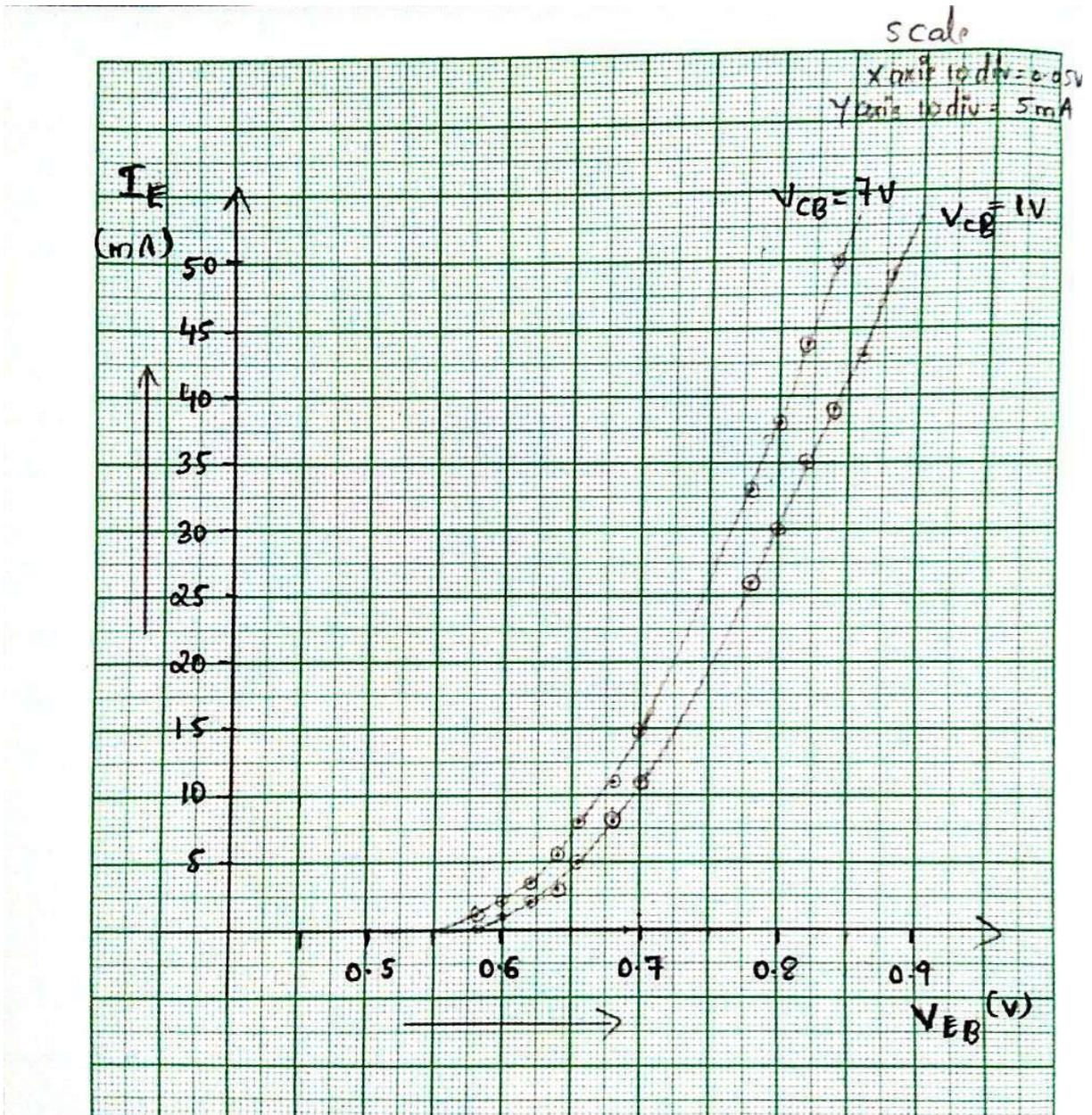


## 4.2 Observations

### INPUT CHARACTERISTICS

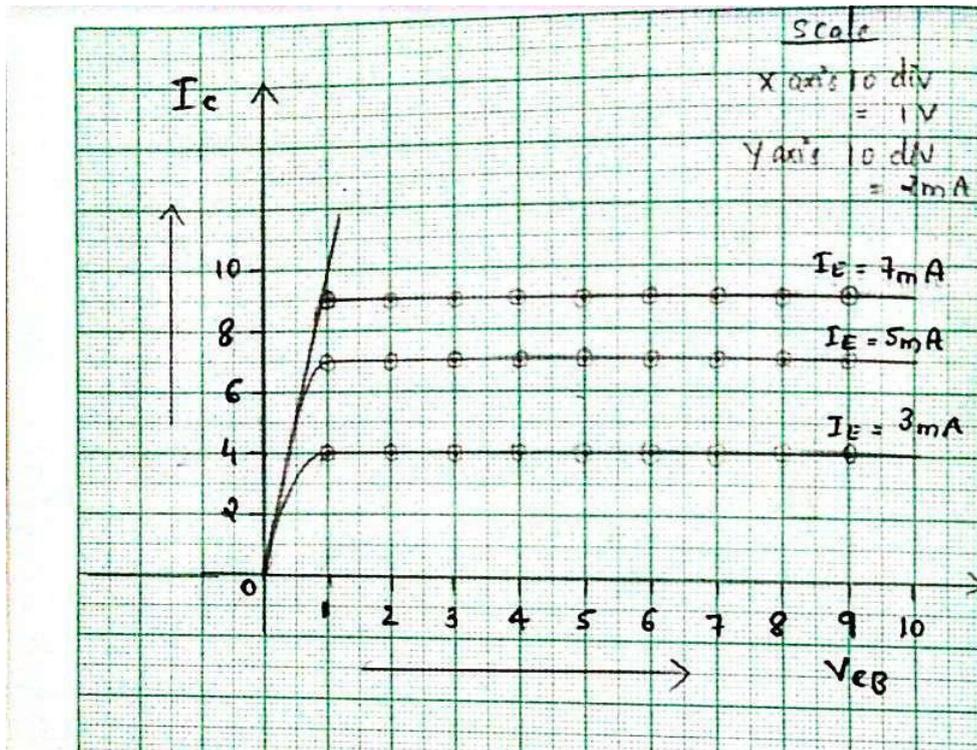
$V_{CB} = 1 \text{ V}$		$V_{CB} = 7 \text{ V}$	
$V_{EB} \text{ (V)}$	$I_E \text{ (mA)}$	$V_{EB} \text{ (V)}$	$I_E \text{ (mA)}$
0.58	0	0.58	1
0.6	1	0.6	2
0.62	2	0.62	3.5
0.64	3	0.64	5.5
0.66	5	0.66	8
0.68	8	0.68	11
0.7	11	0.7	15
0.72	14	0.72	18
0.74	18	0.74	23
0.76	22	0.76	28

0.78	26	0.78	33
0.8	30	.8	38
0.82	35	.82	44
0.84	39	.84	50
0.86	43	.86	Out of range
0.88	49		
0.9	Out of range		



## OUTPUT CHARACTERISTICS

$I_E = 3 \text{ mA}$		$I_E = 5 \text{ mA}$		$I_E = 7 \text{ mA}$	
$V_{CB} \text{ (V)}$	$I_C \text{ (mA)}$	$V_{CB} \text{ (V)}$	$I_C \text{ (mA)}$	$V_{CB} \text{ (V)}$	$I_C \text{ (mA)}$
0	4	0	7	0	9
1	4	1	7	1	9
2	4	2	7	2	9
3	4	3	7	3	9
4	4	4	7	4	9
5	4	5	7	5	9
6	4	6	7	6	9
7	4	7	7	7	9
8	4	8	7	8	9
9	4	9	7	9	9



## Calculations from the Graph

1) Input characteristics:

$$\text{Input Impedance} = \Delta V_{EB} / \Delta I_E = (0.88 - 0.84) / (50 - 49) \\ = 0.25 / 1 = 0.25 \Omega$$

$$\text{Reverse voltage gain} = \Delta V_{EB} / \Delta V_{CB} = (0.64 - 0.62) / (3 - 2) \\ = 0.02 / 1 = 0.02$$

2) Output Characteristics:

$$\text{Forward Current gain} = \Delta I_C / \Delta I_E = (9 - 7) / (7 - 5) = 2 / 2 = 1$$

## 4.3 Results

- The Input resistance =  $0.25 \Omega$
- The Reverse Voltage gain =  $0.02$
- The Forward Current gain =  $1$

## CONCLUSIONS

In this Chapter we studied the input and output characteristics of an NPN transistor in CB configuration. We have also included the observations and graphs of the same.

## CHAPTER-5

# CHARACTERISTICS OF COMMON COLLECTOR CONFIGURATION

### INTRODUCTION

In this chapter we will be discussing about the input and output characteristics of Common Collector Configuration

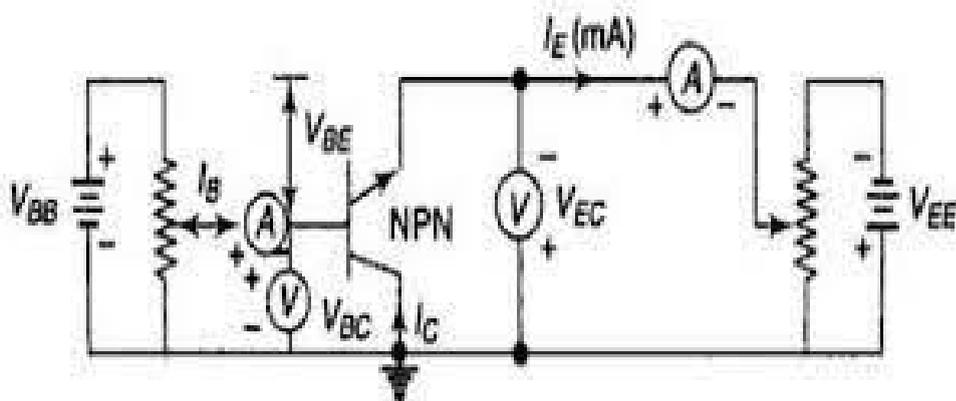
### Aim

To study the input and output characteristics of a transistor in a common collector configuration(CC).

### Apparatus

Transistor BC 107, Rheostat, Analogue ammeter, Analogue voltmeter, Connecting wires

### Circuit Diagram



## 5.1 Procedure

### a) Input Characteristics:

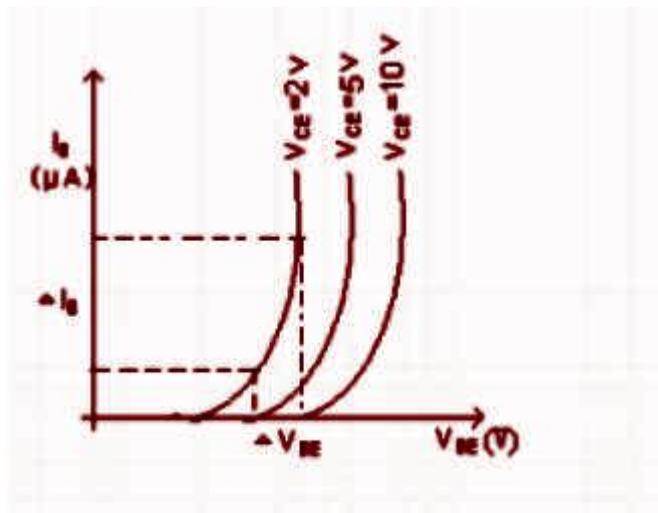
Connect the circuit as shown in the circuit diagram. Keep output voltage  $V_{CE}$  as constant rheostat. Varying gradually, note down base current  $I_B$  and emitter-base voltage ( $V_{BE}$ ). Step size is not fixed because of the nonlinear curve. Repeat the experiment for different constant values of  $V_{CE}$ .

### b) Output Characteristics:

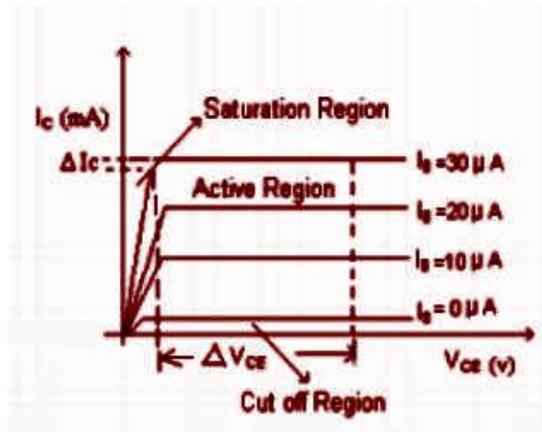
Fix base current,  $I_B$  at constant value. Vary the output voltage in steps. Measure the voltage  $V_{CE}$  and current  $I_C$  for different values. Repeat the experiment for different constant values of  $I_B$ . Draw output static characteristics for tabulated values.

Plot the input characteristics for different values of  $V_{CE}$  by taking  $V_{BE}$  on X-axis and  $I_B$  on Y-axis taking  $V_{CC}$  as constant parameter. Plot the output characteristics by taking  $V_{CE}$  on X-axis and  $I_C$  on Y-axis taking  $I_B$  as a constant parameter.

## Graph



Input Characteristics



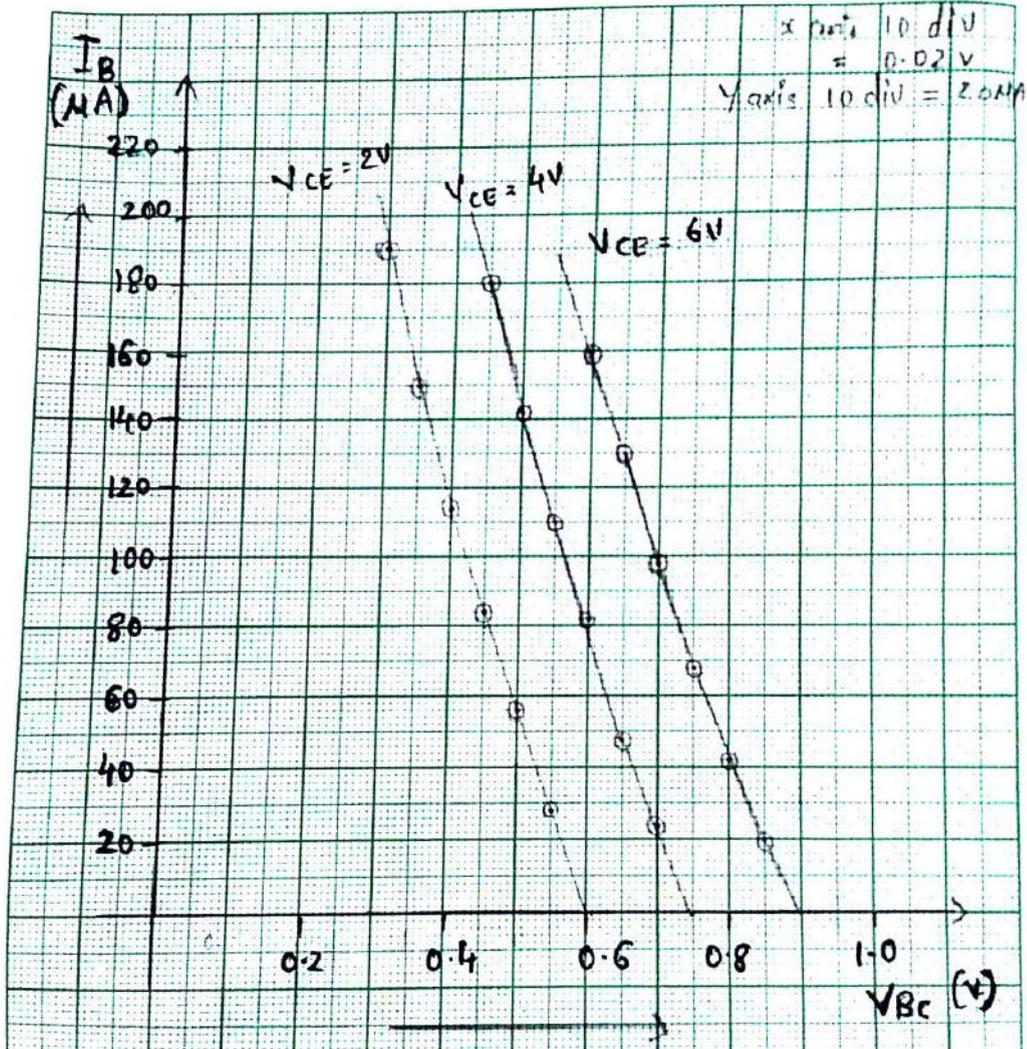
Output Characteristics

## 5.2 Observations

### INPUT CHARACTERISTICS

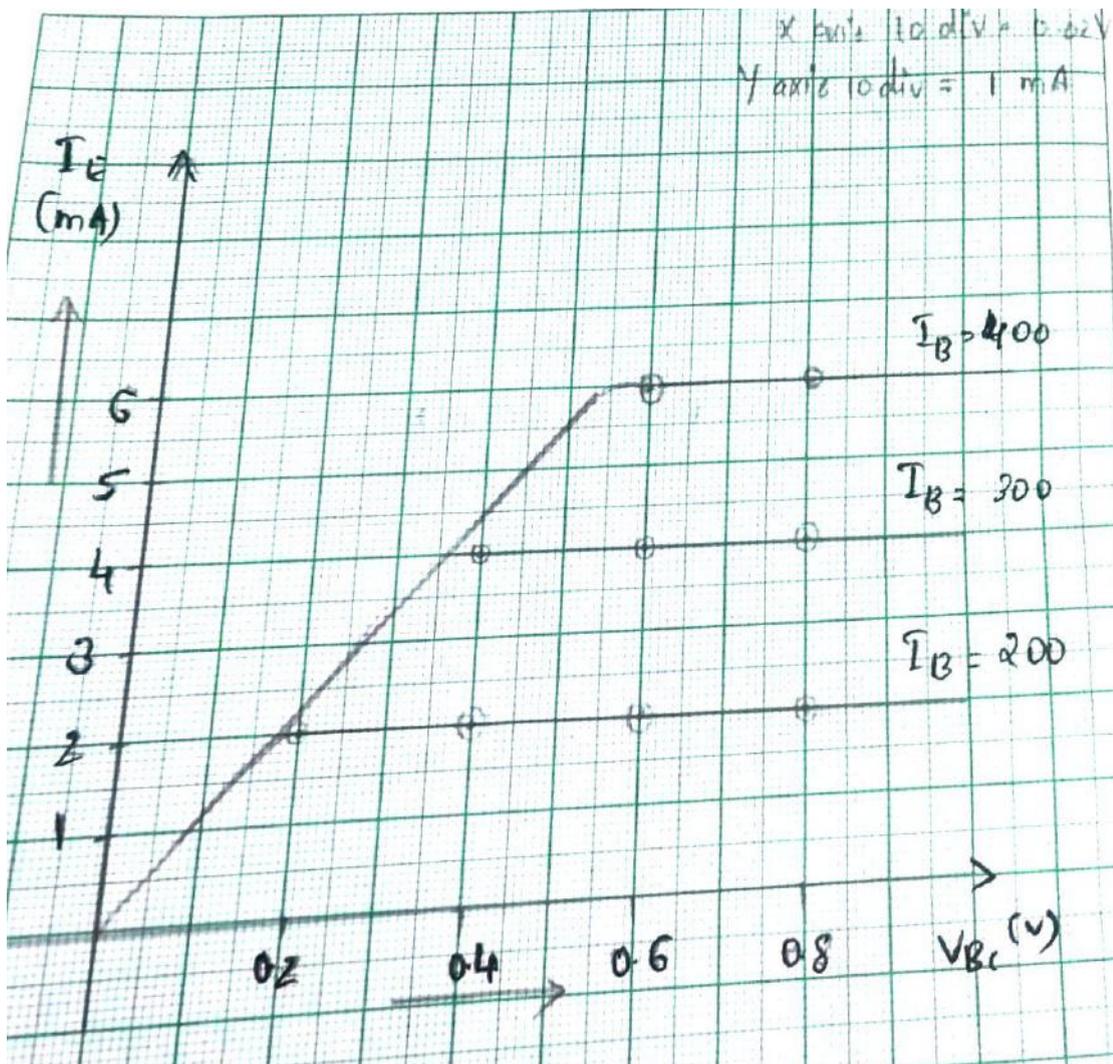
$V_{EC} = 2V$		$V_{EC} = 4V$		$V_{EC} = 6V$	
$V_{BC}$ (V)	$I_B$ ( $\mu A$ )	$V_{BC}$ (V)	$I_B$ ( $\mu A$ )	$V_{BC}$ (V)	$I_B$ ( $\mu A$ )
0.9	0	0.75	0	0.6	0
0.85	20	0.7	24	0.55	28
0.8	42	0.65	48	0.5	56
0.75	68	0.6	82	0.45	84
0.7	98	0.55	110	0.4	114
0.65	130	0.5	142	0.35	150
0.6	160	0.45	180	0.3	190

Scale



## OUTPUT CHARACTERISTICS

$I_B = 200 \mu A$		$I_B = 300 \mu A$		$I_B = 400 \mu A$	
$V_{BC} (V)$	$I_E (mA)$	$V_{BC} (V)$	$I_E (mA)$	$V_{BC} (V)$	$I_E (mA)$
0	0	0	0	0	0
0.2	2	0.2	2	0.2	2
0.4	2	0.4	4	0.4	4
0.6	2	0.8	4	0.6	6
0.8	2	2	4	0.8	6



## Calculations from the Graph

a. Input resistance =  $\Delta V_{BC} / \Delta I_B = 0.5/20 = 0.025\Omega$

b. Reverse voltage gain =  $\Delta V_{BC} / \Delta V_{EC} = 0.15/2 = 0.075$

c. Forward current gain =  $\Delta I_E / \Delta I_B = 2/100 = 0.02$

## 5.3 Results

a. Input Resistance =  $0.025\Omega$

b. Reverse Voltage Gain =  $0.07$

c. Forward Current Gain =  $0.02$

## CONCLUSIONS

In this Chapter we studied the input and output characteristics of an NPN transistor in CC configuration. We have also included the observations and graphs of the same.

## CHAPTER-6

# SUMMARY AND FUTURE PROSPECTS

### 6.1 SUMMARY

In this project we conducted a detailed study of characteristics of the transistor in different configurations i.e, common emitter configuration, common base configuration and common collector configuration.

In Common emitter configuration, the emitter is grounded and it is the common terminal for both the input and output. The base is used as input terminal and collector is used as output terminal. In common emitter configuration current gain and voltage gain are calculated.

In Common base configuration the base is grounded and it acts as the common terminal. Here emitter is the input terminal and collector is the output terminal. In common base configuration output voltage gain is calculated .

In common collector configuration the collector is grounded and it is the common terminal for both the input and output. Here base is input terminal and emitter is the output terminal.

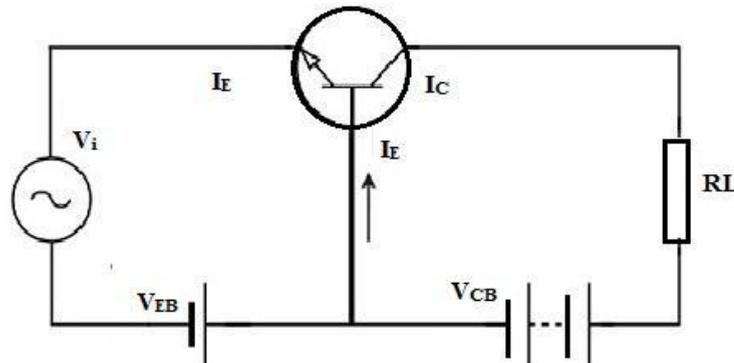
Common Emitter (CE)	Common Base ( CB )	Common Collector ( CC )
Emitter is grounded.	Base is grounded.	Collector is grounded.
Current gain ( $\beta$ ) in CE configuration is given by $\beta = \Delta I_C / \Delta I_B$ We got $\beta = 0.2$	Current gain ( $\alpha$ ) in CB configuration is given by: $\alpha = \Delta I_C / \Delta I_E$ Here $\alpha = 1$	The current gain is calculated as , $\gamma = \Delta I_E / \Delta I_B$ We got $\gamma = 0.02$
Input resistance is obtained $0.002 \Omega$	Input resistance is obtained as $0.25 \Omega$	Input resistance is obtained as $0.025 \Omega$
The reverse voltage gain is given by: $\Delta V_{EB} / \Delta V_{CE} = 0.5$	The reverse voltage gain is given by: $\Delta V_{EB} / \Delta V_{CB} = 0.02$	The reverse voltage gain in CC configuration is given by $\Delta V_{BC} / \Delta V_{EC} = 0.07$
It is used as audio frequency	It is used for amplification purposes.	. It is used for impedance matching

## 6.2 FUTURE PROSPECTS OF PRESENT WORK

- ❖ **Transistor as an Amplifier:** An amplifier circuit can be defined as a circuit that amplifies a signal. The amplifier's input is either a voltage or a current, and the output is an amplifier input signal. A transistor amplifier is an amplifier circuit that uses a transistor . Transistor amplifier circuits are used in a variety of applications, including audio, radio, and optical fibre communication.
- ❖ **Transistor as an Amplifier Circuit:** A transistor can be used as an amplifier by boosting the strength of a weak signal. One may

gain a sense of how a transistor circuit operates as an amplifier circuit by looking at the transistor amplifier circuit below.

The input signal can be applied between the emitter-base junction and the output across the  $R_c$  load in the collector circuit in the circuit below.



Always remember that the input is forward-biased, while the output is connected reverse-biased for proper amplification. Thus, we apply DC voltage ( $V_{EE}$ ) to the input circuit in addition to the signal, as indicated in the above diagram. Generally, the input circuit often has low resistance; a small change in signal voltage at the input causes a considerable change in the emitter current. Because of the transistor's action, a change in the emitter current will result in a change in the collector circuit. The flow of collector current through a  $R_c$  currently generates a huge voltage across it. As a result, the weak signal applied at the input circuit will be amplified at the collector circuit in the output. The transistor acts as an amplifier in this manner.

- ❖ **Microphone:** Our voice or sound wave is converted to an electronic signal by the microphone, which is a transducer. The magnitude of the sound wave varies with time according to our voice because it does not have a constant value. Because of the small alternating voltage created by the microphone, the electrical output of the microphone varies in response to sound waves, as the base current  $I_b$  varies. This means

that a slight change in  $I_b$  can induce a huge change in  $I_c$ . When the microphone output is fed into the transistor as an input, the variable collector current  $I_c$  flows into the loudspeaker, and we know that if the transistor's input changes, the output of the transistor will fluctuate dramatically. As a result, the transistor enhances the microphone's electronic signal. Although the frequency remains constant, the amplitude of the sound wave from the loudspeaker is greater than that of the sound waves fed into the microphone.

❖ **Transistor Used as a Switch:** BJT Transistors can be used to manage DC power to a load by acting as a switching device. The controlling current flows between the emitter and the base, whereas the switched (controlled) current flows between the emitter and the collector.

To brief other practical application of transistors, it includes:

- Transistors are used in oscillators and modulators as amplifiers.
- Transistors are used in Radio-frequency circuits for wireless systems.
- Transistor switches are used in Burglar alarms, industrial control circuits, memories and microprocessors.
- They are used in Sub Wordline Driver (SWD) to produce low frequency currents.
- MOSFETs are used in Chopper circuits.
- JFET, MOSFET can act as a passive element like Resistor.

The first announcement of the transistor's development was made with absolutely no fanfare. Originally, the integrated circuit was supposed to be solely valuable in military applications. Investors in the microprocessor pulled out before it was built, believing it would be a waste of money. The transistor and its descendants have always been discounted, despite the fact that they have shown to be more capable than anyone anticipated. Today's predictions

also suggest that the transistor's capabilities are limited. This time, the expectations are that transistors will not be able to shrink any farther than they are now. Then again, in 1961, scientists predicted that no transistor on a chip could ever be smaller than 10 millionths of a metre -- and on a modern Intel Pentium chip they are 100 times smaller than that.

With the benefit of hindsight, such predictions appear absurd, and it's easy to imagine that today's predictions will sound just as absurd thirty years from now. However, recent size limit predictions are based on some very basic physics, such as the size of the atom and the electron. Because transistors operate on electric current, they must constantly be large enough to allow electrons to pass through.

On the other hand, all that's really needed is a single electron at a time. It would be phenomenally small for a transistor to operate with only one electron, but it is theoretically possible. Future transistors could make contemporary circuits appear as large and bulky as vacuum tubes are now. The trouble is that once gadgets get that small, everything moves according to quantum mechanics' principles, which allows electrons to perform some strange things. In such a small device, the electron behaves more like a wave than a single particle. It would smear out in space as a wave, and it may even tunnel through the transistor without actually acting on it.

Despite this, researchers are actively working on new ways to produce such tiny devices, forsaking silicon and all current production methods. Single electron transistors are what they're called, and depending on whether or not they're keeping an electron, they're termed "on" or "off." (At this level, transistors are only employed as binary coding switches, not as amplifiers.) In reality, the quantum weirdness of the ultra-small might be exploited by such a minuscule device. Instead of merely "on" or "off," the electron might be configured to have three positions: "somewhere between on and off." This would pave the way for whole new types of computers. However, there are currently no practical single electron transistors.

Miniaturisation is possible even without new technology. Present transistors are expected to be at least twice as small by 2010 if current manufacturing procedures are improved. Intel's latest processor has nearly a billion transistors, implying that four times as many transistors on a chip are theoretically achievable. Computers with chips like this would be far "smarter" than they are now.

Transistors are the most basic electronic components that can be found in every device. They've grown in size and performance over the last 30 years. Their capacity to behave as a switch or to amplify current or voltage has allowed them to be used in a wide range of applications, including logic gates in computer processors and sound amplifiers. The ability to hold more electronics in one's hand than could be contained in a large building in the days when vacuum tubes were the only active devices available is perhaps transistors' most important contribution. They have made it possible to hold more electronics in one's hand than could be contained in a large building in the days when vacuum tubes were the only active devices available. As a result, complex functionality may now be packed into small packages—computers, cell phones, automotive engine controllers, and a variety of other devices.

A continuous process of research and development is underway to improve transistor performance parameters and to identify new semiconductor materials other than silicon. Transistors are being created to assist rapid technological advances such as wireless charging and energy conversion. Transistors are still being studied extensively around the world, as reducing the size and power consumption of individual transistors on a chip can result in quick profits. Researchers have already produced extremely small transistors made of only a few molecules in the lab, including one that uses only a single electron. They've also shown that transistors constructed of plastic are feasible, and that they could be even cheaper and more shock-resistant than conventional electronics.

Increasing transistor densities on chips (which manufacturers desire) is expected to be achieved in the near future via improving fabrication techniques for classic semiconductor devices.

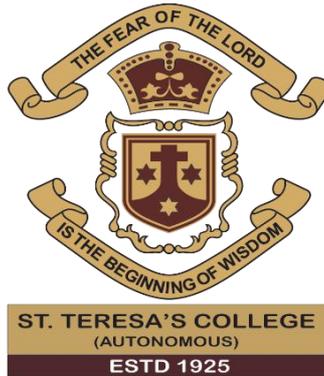
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# **SECURE EDUCATIONAL CREDENTIALS USING BLOCKCHAIN**

**ST. TERESA'S COLLEGE (AUTONOMOUS)  
AFFILIATED TO MAHATMA GANDHI UNIVERSITY**



## **PROJECT REPORT**

*In partial fulfilment of the requirements for the award of the degree of*

**BCA (CLOUD TECHNOLOGY AND INFORMATION  
SECURITY MANAGEMENT)**

*By*

**Layana S P - SB19BCA009**

**&**

**Sona Pappachan - SB19BCA021**

**III DC BCA (CLOUD TECHNOLOGY AND INFORMATION SECURITY  
MANAGEMENT)**

*Under the guidance of*

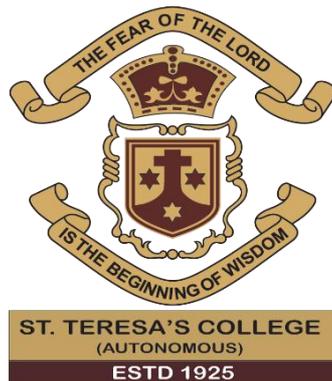
**Ms. Rishika K K**

**DEPARTMENT OF COMPUTER APPLICATIONS**

**MARCH 2022**

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**Ms. Rishika K K**

**DEPARTMENT OF COMPUTER APPLICATIONS**

**MARCH 2022**

## DECLARATION

We, undersigned hereby declare that the project report, **Secure Educational Credentials Using Blockchain**, submitted for partial fulfilment of the requirements for the award of degree of BCA St. Teresa's College (Autonomous), Ernakulam (Affiliated to Mahatma Gandhi University), Kerala is a bonafide work done by me under supervision of **Ms. Rishika K K**. This submission represents my ideas in my own words and where ideas or words of others have been included. We have adequately and accurately cited and referenced the original sources. We also declare that we have adhered to the ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or source in our submission. We understand that any violation of the above will be a cause for disciplinary action by the institute and/or the University and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not previously formed the basis for the award of any degree, diploma or similar title of any other University.

Ernakulam

March 2022

Layana S P – SB19BCA009

Sona Pappachan - SB19BCA021

**ST. TERESAS COLLEGE (AUTONOMOUS), ERNAKULAM**

**BCA (CLOUD TECHNOLOGY & INFORMATION SECURITY  
MANAGEMENT)**

**DEPARTMENT OF COMPUTER APPLICATIONS**



**CERTIFICATE**

This is to certify that seminar report **Secure Educational Credentials Using Blockchain** submitted by **Sona Pappachan** and **Layana S P** to St. Teresa's College, Cochin in partial fulfilment of the requirements for the award of the Degree of BCA in CT & ISM is a bonafide record of the seminar work carried out by him/her under my/our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

*For*  
*oblaus*  
*4/4/22*

**RISHIKA K K**

**Internal Supervisor**



**RAJIS PILLAI**

*For* **Head of the Department**

*[Signature]*  
*4/4/22*

**External Supervisor**

## ACKNOWLEDGEMENT

First and foremost we thank God Almighty for his blessings. We take this opportunity to express our gratitude to all those who helped me in completing this seminar successfully. We wish to express my sincere gratitude to the Manager **Rev. Dr. Sr. Vinitha CSST**, Director **Rev. Sr Emeline CSST** and the Principal **Dr. Lizzy Mathew** for providing all the facilities.

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We have indebted to my beloved teachers whose cooperation and suggestion throughout the project helped us a lot. We thank all my friends and classmates for their support.

We convey my hearty thanks to my parents for the moral support, suggestion and encouragement.

## **ABSTRACT**

In the digital world, each and everything is digitalized in which the certificate of SSLC, HSC, and academic certificate are digitalized in the educational institution and provided to the students. Students are difficult to maintain their degree certificates. Verifying a diploma/certificate today takes a good amount of time and requires human resources or human resources to request confirmation of details from universities. A possible solution is Blockchain; Blockchain for education may be a new concept. By using this technology, no need for a central authority to validate certificates.

We are building a platform that will be open, accessible and one piece of software at a time and students can get Blockchain-based educational certifications. For the organization and institution, verification and validation of certificates are tedious and cumbersome. Our project will help to store the certificate in the blockchain system and provide security. First, the paper certificates are converted into digital certificates. Then the certificates are store in blockchain. And these certificates are validated by using the mobile application. By using blockchain technology we can provide a more secure and efficient digital certificate validation.

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# CHAPTER - 1

## INTRODUCTION

Blockchain was introduced in the year 2008 by Satoshi Nakamoto. Blockchain is one of the online ledgers which provide decentralized and transparent data sharing. In this project, we design an android application used to provide secure verification of our certificates. In nowadays, all Graduation certificates and transcripts hold information that is easily tampered illegally by individuals and should not be easily accessible to outside entities. Hence, there is a high need for an efficient mechanism, that can guarantee the information in such certificates is original, which means the document has originated from a reliable and authorized source and is not forged. Various systems have been designed to secure e-certificates for education institutions and to store them securely in cloud-based systems.

Blockchain is the main tool to felicitate this need and when combined with different hashing techniques, this becomes a powerful method for protecting the data. It also helps in eliminating the need for constant verification of certificates. Blockchain technology is used to reduce the incidence of certificate forgeries and ensure that the security, validity, and confidentiality of graduation certificates would be improved. Technologies that exist in security domains include digital signatures, which are used in digital documents to provide authentication, integrity, and non-repudiation. Also with blockchain in play, the storage of certificates are more secure. With these technologies, an application created that facilitates the secure validation of digital certificates.

### 1.1 OBJECTIVE

The main objective of the Certificate validation using blockchain is to store the certificate in the blockchain system and provide security.

### PROBLEM DEFINITION

Students are difficult to maintain their degree certificates. For the organization and institution, verification and validation of certificates are tedious and cumbersome.

## 1.2 RELATED WORK

As of now, mainly Blockchain is used in cryptocurrency. When Satoshi Nakamoto (Bitcoin Developer) saw problems in centralized currency, he tried to build digital cash system without a central entity, and it will be like a Peer-to-Peer network, this became the birth of cryptocurrency.

Cryptocurrency is a method/way in the Blockchain using encryption technique to control the creation of monetary units and to verify the transfer of funds. The transaction is known instantly by the whole network. But minors take some time to confirm this transaction. This is minor's job in a cryptocurrency-network, and they get rewarded with a token (some amount) of the cryptocurrency.

In a decentralized network, we don't need a central server which keeps the record of the transaction/balances. Every node in the system has a copy of all transactions to check if current transactions are valid or not.

### Top 5 Cryptocurrency

- Bitcoin BTC
- Ripple XRP
- Ethereum ETH
- Bitcoin Cash BCH
- Cardano ADA.

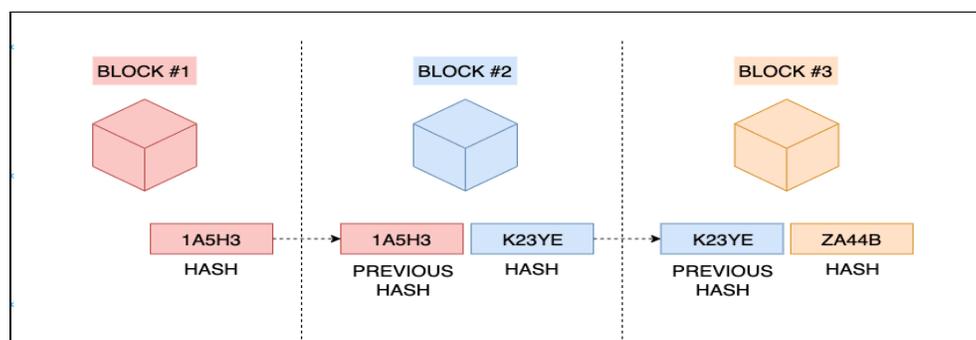


Figure 1.1 : Blockchain Technology

**Bitcoin BTC:**

Satoshi Nakamoto is the unknown inventor of Bitcoin. It was released in 2009, and its symbol

"A new electronic cash system that uses a peer-to-peer network to prevent double-spending. It is completely decentralized with no central authority or server" – Satoshi Nakamoto, 09 January 2009, announcing Bitcoin on Source Forge. It is a digital currency system based on peer-to-peer virtual data. It uses peer-to-peer technology or network to operate with no central authority or banks; managing transactions and the issuing of Bitcoin is carried out collectively by the system.

Bitcoin is 1<sup>st</sup> cryptocurrency that usages Cryptography to control its creation and transactions, rather than a central authority. It provides a new payment system that is digital in nature and no central authority/mediators are involved. It can be considered as "Cash for Internet".

**Ripple XRP**

Ripple was developed by Arthur Britto, David Schwartz & Ryan Fugger. It was released in 2013, and its symbol is XRP.

It is a real-time payment network that offers immediately certain and low-cost international payments. It "enables banks to settle cross-border payments in real time, with end-to-end transparency, and at lower costs." It is based around a shared, public database which uses a consensus process that allows for payments, exchanges, and remittance in a distributed process. Its Ledger does not require mining that is the major difference from Bitcoin and other cryptocurrency that uses mining concept.

**Ethereum ETH**

Ethereum was developed by the Ethereum Foundation (a Swiss non-profit foundation). It was released in 2015, and its symbol is ETH.

It is a distributed SW platform that use Smart contract to interact with the blockchain. Application based on Ethereum runs without any fraud and 3<sup>rd</sup> party validation

**Bitcoin Cash BCH:**

Bitcoin Cash was developed by Bitmain group. It was released in 2017, and its symbol is BCH. It is the continuation of the Bitcoin project as peer-to-peer digital cash. It is a fork of the Bitcoin blockchain ledger, with upgraded consensus rules that allow it to grow and scale. Its block size limit to eight megabytes. The rule change increasing the Bitcoin block size limit of one megabyte to eight megabytes is classified as a hard fork.

**Cardano ADA**

Cardano was developed by Aggelos Kiayias, and it was released in 2017, and its symbol is ADA. Cardano (ADA) is an “Ouroboros proof-of-stake” cryptocurrency that was created with a research-based approach by engineers, mathematicians, and cryptography experts. The project was co-founded by Charles Hoskinson, one of the five initial founding members of Ethereum. After having some disagreements with the direction that Ethereum was taking, he left and later helped to create Cardano.

## CHAPTER - 2

### LITERATURE SURVEY

According to the Taiwan Ministry of Education statistics, about one million graduates each year, some of them will go to countries, high schools or tertiary institutions to continue to attend, and some will be ready to enter the workplace employment [1]. During the course of study, the students' all kinds of excellent performance certificates, score transcripts, diplomas, etc., will become an important reference for admitting new schools or new works. As schools make various awards or diplomas, only the names of the schools and the students are input. Due to the lack of effective anti-forgery mechanism, events that cause the graduation certificate to be forged often get noticed. In order to solve the problem of counterfeiting certificates, the digital certificate system based on blockchain technology was proposed by [1]. By the unmodifiable property of blockchain, the digital certificate with anti-counterfeit and verifiability could be made. The procedure of issuing the digital certificate in this system is as follows. First, generate the electronic file of a paper certificate accompanying other related data into the database, meanwhile calculate the electronic file for its hash value. Finally, store the hash value into the block in the chain system. The system will create a related QR-code and inquiry string code to affix to the paper certificate. It will provide the demand unit to verify the authenticity of the paper certificate through mobile phone scanning or website inquiries. Through the unmodifiable properties of the blockchain, the system not only enhances the credibility of various paper-based certificates, but also electronically reduces the loss risks of various types of certificates.

During the last decade, several misbehaving Certificate Authorities (CA) have issued fraudulent TLS certificates allowing MITM kinds of attacks which result in serious security incidents.

In order to avoid such incidents, Yakubov et al. recently proposed a new PKI architecture where CAs issue, revoke, and validate X.509 certificates on a public blockchain. However, in their proposal TLS clients are subject to MITM kinds of attacks and certificate transparency is not fully provided. In this paper, we eliminate the issues of the Yakubov et al.'s scheme and propose a new PKI architecture based on permissioned blockchain with PBFT consensus mechanism where the consensus nodes utilize a dynamic threshold signature scheme to generate signed blocks[2]. In this way, the trust to the intermediary entities can be completely eliminated during certificate validation. Our scheme enjoys the dynamic property of the threshold signature because TLS clients do not have to change the verification key even if the validator set is dynamic. We implement our proposal on

private Ethereum network to demonstrate the experimental results. The results show that our proposal has negligible overhead during TLS handshake[2]. The certificate validation duration is less than the duration in the conventional PKI and Yakubov et al.'s scheme.

The security of web communication via the SSL/TLS protocols relies on safe distributions of public keys associated with web domains in the form of X.509 certificates. Certificate authorities (CAs) are trusted third parties that issue these certificates. However, the CA ecosystem is fragile and prone to compromises. Starting with Google's Certificate Transparency project, a number of research works have recently looked at adding transparency for better CA accountability, effectively through public logs of all certificates issued by certification authorities, to augment the current X.509 certificate validation process into SSL/TLS[3]. In this paper, leveraging recent progress in blockchain technology, we propose a novel system, called CTB, that makes it impossible for a CA to issue a certificate for a domain without obtaining consent from the domain owner. We further make progress to equip CTB with certificate revocation mechanism[3]. We implement CTB using IBM's Hyperledger Fabric blockchain platform. CTB's smart contract, written in Go, is provided for complete reference.

Current digital certification revocation systems are insufficient in the application scenario of multiple certification authorities (CAs), and it leads to a lack of mutual trust, access stability, and timeliness of data synchronization between CAs. We propose a decentralized digital certificate revocation system based on consortium blockchain technology with a secret sharing scheme[4]. It can invalidate the digital certificate in special cases to protect the user's information and property security. Based on the characteristics of the decentralized consensus mechanism, consortium blockchain technology is the core technology of the system. The scheme achieves collaborative management of digital certificate revocation lists (CRLs) by multiple CAs, and introduces secret sharing scheme, further safeguarding the reliability of the maintenance process, and then the online certificate status protocol (OCSP) can be developed based on this system[4]. This system is security, effective, and cannot be tampered. Compared with the traditional revocation scheme, it achieves trusted and reliable CRL system above multiple CAs, which can provide new ideas for the way of digital certificate revocation and expand the application range of blockchain technology.

Every year lakhs of students graduating from different university. The graduation certificates issued by universities and other educational institutions are among the most important documents for graduates. It is an asset for each students. Nowadays everyone has to show his/her Document and

Certificate to any other person for some purpose/job. After seeing the document third person cannot validate the originality of the certificate. Verifying a diploma/certificate today takes a good amount of time and requires human resources or human resources to request confirmation of details from Universities[5]. The advance of information technology and the availability of low-cost and high-quality office equipment in the market have enabled forgery of important documents such as certificates, identity cards, passports etc. The goal of this paper is to propose a certificate management and validation system that can offer a potential solution for academic certificate issuing and verification using blockchain technology[5]. The blockchain technology contains several functions including hash, public/private key cryptography, digital signatures, peer to peer networks and proof of work. The beneficiary or the institution receiving the certificate as a proof of credential would get a clear view on the history of the certificate. The certificate also contains the immutable record of issuing authority, owner of the certificate and date and time of issuance.

## **Chapter - 3**

### **SYSTEM ANALYSIS**

#### **3.1 EXISTING SYSTEM**

In the digital world, each and everything is digitalized in which the certificate of SSLC, HSC, and academic certificate are digitalized in the educational institution and provided to the students. Students are difficult to maintain their degree certificates. For the organization and institution, verification and validation of certificates are tedious and cumbersome.

#### **LIMITATIONS**

- It is time consuming as the system is handled manually.
- Assurance of data security is not given.
- In long run, it is difficult to maintain records.
- Manpower requirement is huge.
- It is hectic to handle the huge transaction.

#### **OBJECTIVES OF THE PROPOSED SYSTEM**

By using the unmodifiable property of blockchain provide more security. Confidentiality is transparent with each transaction visible to all the peers. Our application runs in offline mode. The certificate is validated rapidly. Provide accurate and reliable information

#### **3.2 PROPOSED SYSTEM**

Our project will help to store the certificate in the blockchain system and provide security. First, the paper certificates are converted into digital certificates.

##### **A. Methodology**

In this proposed system the academic, sports certificates are converted into digital certificates using sampling and quantization. Then the certificates are added with the hash values generated for the digital certificate and store it into the blocks. The chaotic algorithm used for generating the hash value. Each block consists of the hash value, timestamp, and hash value of the previous block. These blocks are linked together in the form of blockchain. The institution registers the student details in our interface (application) by providing details like name, email id and these are stored in the database. The certificate issued by the registrar is stored in the application and they form a blockchain. The employer or verifier can validate the certificate by entering the student details.

## **B. Digital Certificate Creation**

In this, the student certificates are converted into digital certificates. The academic certificate and sports certificate are issued by the institution are stored in the database. By using the analog image to digital image conversation method the certificate can be converted into a digital certificate. The value 0's and 1's are created for each certificate. In a digital image, all the coordinates on 2-d function and the corresponding values are finite. Each value considered a pixel. By using admin login the administrator login to our application to upload the student's certificate in the application then it will convert an analog image to digital image using sampling and quantization. The next page of the application shows the add student and add a certificate. If an admin tape the add student, the new student gets registered. If an admin clicks the added certificate, the student certificate is uploaded.

## **C. Hash Code Generation**

The chaotic algorithm is used to generate the hash value for the certificate. This algorithm takes input in different size and produces the output in a fixed size. This algorithm needs to define the mapping scheme, initial condition, and parameters. Verifying process is started by using the same initial condition and parameters to generate the same output. When the certificate is uploaded, the hash value is created for the digital certificate. Compared to SHA-1, the chaotic hash function are collision- resistant.

## **D. Digital certificate validation**

In this, the created digital certificate is validated. Certificates that are stored in the blockchain are validated by matching the hash value. The verification of the hash value of the certificate is used to avoid tampering. The employer or verifier can log in to the application using their login id and password. They can select and certificate type which they want to validate. Then tape the validate button in the application. If the certificate is original the output will be a valid certificate and success. If the certificate is not original or modified the output will be error and modified certificate.

## **E. Working of Application**

In our application the first page is admin login, the next page consists of add student and certificate and last verifier page. The admin can log in to our application using the admin login id and password. Then the admin can add the student and their certificates by tap the add student and add certificate button. Next, the verifier can validate the certificate using the verifier login id and password.

They provide the login id of the student and select the certificate type and tap the verify button. If the uploaded certificates are original then the result will be a success. Otherwise, the result will be error and modified.

## **ADVANTAGES**

1. System support online registration.
2. The system maintains student information properly.
3. The system stores certificates information.

## **3.3 BACKGROUND**

### **1. Hashing**

Hashing is a mathematical process that generates a value or values from a string of text. When a message is meant for a single recipient, hashing is one way to ensure confidentiality during the transmission process. The hash is produced using an algorithm, which helps to protect the transmission's protection from tampering. Hashing is also a tool for efficiently sorting key values in a database table.

MD5 and SHA-1 are traditional cryptographic hash functions with a single goal: transforming the source input (message) into a fixed-length bit string (hash). And if they all have a somewhat different function, they are often referred to as (digital) signatures, checksums, or simply hash values. Inverting cryptographic hash functions, that is, recreating the input data solely from its hash value, is considered virtually impossible.

### **2. Blockchain Technology**

A blockchain is a novel technology that is continuously evolving and being applied in various domains. Its inception is from the famous digital currency proposed by Satoshi Nakamoto [2]. Initially, it was used only for financial transactions, but now it is being used or being proposed in every domain that needs immutable and secure record-keeping or ledger. Blockchain is a collection of generated blocks using cryptographic hash functions and connected together with the previous block in the form of a secure chain using cryptographic algorithms [7]. It's a special form of distributed ledger technology that operates on a peer-to-peer (P2P) network. It uses a consensus algorithm to validate a new block, and once validated and added into the Blockchain, these blocks cannot be altered.

### 3. Types of Blockchain

Private and public blockchains are the two main styles of blockchains. There are, however, several variants, such as Consortium and Hybrid blockchains. Any Blockchain is made up of a group of nodes linked by a peer-to-peer (P2P) network. Each network node has a copy of the mutual ledger, which is maintained regularly. Each node has the ability to validate transactions, send and receive messages, and building blocks.

#### 3.1 Public Blockchain

A public blockchain is a non-restrictive, permissionless distributed ledger system. As an authorized node, anybody with an internet connection can access a blockchain platform and become a network user. A public Blockchain node or user can search current and historical records, verify transfers, proof-of-work incoming blocks, and mine. Cryptocurrency mining and trading are the most common uses of shared blockchains. As a result, the most commonly used decentralized blockchains are Bitcoin and Litecoin. Public blockchains are largely secure if users closely apply safety guidelines and procedures.

#### 3.2. Private Blockchain

A permissioned or limited blockchain can only be used in a protected network known as a private blockchain. Private blockchains are usually used by an organization or business where only a small number of users can join a blockchain network. The level of conformity, authorizations, licenses, and accessibility are all determined by the governing organization. As a result, private blockchains are functionally similar to public blockchains, but their network is smaller and more limited. Private Blockchain is generally applied in voting, supply-chain, digital identity, wealth management, and other applications.

#### 3.3. Consortium/ Federated Blockchain

A consortium blockchain is a semi-decentralized ledger that a group of companies or institutions manages. In comparison, a private blockchain, which a single person owns, looks like this. More than one person may act as a node in such a Blockchain for transacting data or mining. Government departments, financial institutions and other organizations also use consortium blockchains.

### 3.4. Hybrid Blockchain

A hybrid blockchain combines the benefits of both proprietary and public blockchains. It incorporates features from all forms of blockchains, allowing for both a private permission-based and a public permission-less scheme. Users will monitor who has access to which data held in the Blockchain with a hybrid network like this. A few of the Blockchain's data or documents will be made available, with the remainder remaining private in the private network. Users will conveniently access a private network or several public blockchains thanks to Blockchain's hybrid framework.

### 4. Blockchain Features:

Blockchain technology is not only used for cryptocurrencies but it is being used in various diverse applications and being proposed in many more due to the following features :

- a. Immutability: One of the most important blockchain characteristics is immutability, which ensures that the technology remains where it is – a stable, unalterable network.
- b. Decentralized: The network is decentralized, which means there is no one controlling body or individual in charge of the system.
- c. Improved Security: Since there is no need for a central authority, no one can simply adjust network features to their advantage. Encryption adds another layer of protection to the device.
- d. Distributed Ledgers: A public ledger typically contains details about a transaction and its participants. There's nowhere to hide because it's just out in the open. The argument for private or federated Blockchain, on the other hand, is a little different. However, in such situations, a large number of people will see what is actually going on in the ledger. It is because all those users on the device maintain the ledger on the network. To get a better result, the computing power was spread through the machines.
- e. Consensus: Consensus is a community of participating nodes on the network's decision-making mechanism. The nodes will accept easily and reasonably quickly in this case.
- f. Faster Settlement: As opposed to conventional banking schemes, Blockchain allows for a quicker settlement. It will enable a person to pass funds more quickly, which saves time in the long run.

## 5. Application Area for Blockchain

Since cryptocurrencies account for a significant portion of current blockchain networks, most scholars divide them into financial and non-financial categories. Others categorize them based on blockchain versions. We present some blockchain-based applications:

### 5.1. Financial applications

Blockchain technology is currently being used in various financial areas, including business services, financial asset settlement, prediction markets, and economic transactions. Marketplace systems (PMS), which operate as oracles or intelligence sources, are another fascinating area that can influence companies and cryptocurrencies. Blockchain is set to play a critical role in the financial economy's long-term viability, benefiting investors, the existing banking system, and society as a whole.

### 5.2. Governance

Governments have been tasked with managing and maintaining official accounts of residents and/or businesses for several years. Through disintermediating transactions and record-keeping, blockchain-enabled applications can transform the way local and state governments function. Blockchain's transparency, automation, and security for managing public information could potentially prevent corruption and improve government services. Blockchain may be used as a secure networking network for combining physical, social, and industrial infrastructures in a smart city framework. Blockchain governance aims to have the same resources as the state and its related public bodies in a decentralized and effective manner whilst retaining the same legitimacy.

### 5.3. Citizenship and user service

The incorporation of emerging technology into daily life necessitates systems such as Blockchain to reliably identify and certify users' primary attributes such as identity, address, credit history, and other personal characteristics.

### 5.4. Voting

E-voting is being proposed as a promising and game-changing technology to ease out the election process, reduce the law and order complications and reduce time and financial expenditure. Still, due to security issues and cybersecurity threats, it has not gained momentum. Blockchain can provide a trusted and secure platform for e-voting that can remain consistent with domestic laws.

### 5.5. Internet of Things (IoT)

The application of the Internet of Things (IoT) to population growth has resulted in its applications in each daily life domains and become critical for growth. Although there are many advantages of using IoT, various security threats outnumber these advantages. Due to limited hardware capabilities, the traditional cryptographic security mechanism cannot be applied in such an environment. Blockchain can provide a platform and mechanism for securing the IoT network, and it can provide an open IoT network for a secure, reliable and interoperable IoT network.

### 5.6. Healthcare management

Blockchain technology may provide a critical solution for the healthcare providers that have implementations in healthcare management, demographic healthcare history, electronic insurance claims settlement and remote patient patients medical data sharing. It will provide user-oriented medical investigation, stop counterfeit products & medicines, and manage clinical trial data. In specific, Blockchain alongwith Smart Contracts, may solve issues such as clinical trial outcomes' scientific credibility and patient informed consent.

### 5.7. Privacy and security

Significant amounts of confidential and classified knowledge are amassed through centralized institutions, both public and private. Despite the GDPR's goal of regulating the production of this data, there is still a significant gap to be filled. Compared with other reliable computing mechanisms that use data mining techniques, Blockchain is seen as a way to improve the reliability and scalability of big data. As a result, the literature contains privacy and security-oriented applications based on blockchain technologies.

### 5.8. Business and industrial applications

Blockchain may become an important source of novelty in business and management through reinforcing, optimizing, and automating enterprise processes. The IoT and the Blockchain are spawning a slew of innovative e-business models. In a business model, SCs are used to carry out transactions between devices on a distributed network based on Blockchain.

### 5.9. Supply chain management

Blockchain is expected to improve supply chain efficiency and accountability, allowing for more flexible value chains. Blockchain-based technologies, in particular, have the potential to revolutionize supply chains in three areas: visibility, optimization, and demand.

Blockchain can be used in distribution, counterfeit commodity detection, document load collection, origin monitoring, and buyers and sellers to trade directly without intermediaries.

#### 5.10. Energy sector

Blockchain's potential applications in the energy market are many, and they would have a significant impact on both processes and networks. Blockchain can minimize costing and enable new business models, while marketplaces and grids could be best equipped to manage sophistication, data security, and ownership [23]. It can also make the power grid operate more efficiently and effectively control demand response and provide a foundation for more proficient resource consumption monitoring and billing in energy sources.

#### 5.11. Data management

Blockchain is a very suitable technology for data management. Since all of their processes are verifiable, implementations and frameworks built on this technology have improved data protection and allowed by default auditability. This final section on blockchain-based applications cites related literature aimed at data storage that is reliable, safe, and verifiable.

#### 5.12. Miscellaneous applications

Crowdfunding is a suitable use case of blockchain technology. In the humanitarian and philanthropic fields, blockchain implementations may be used to tackle hunger. Blockchain can also build intelligent, secure, distributed, and autonomous transportation networks and securely manage event tickets in smart city contexts. Edge computing and the creation of computational resource sharing networks, grid computing, cloud computing, and the usage of Blockchain as a device connector are several of the IT-related blockchain applications that are of particular concern.

### 6. Blockchain in Education

The Blockchain can help educational institutions strengthen their ability to assist teachers, deliver knowledge to guardians and community members, empower new learning systems, and expand and provide learning opportunities for more students. Figure 1 depicts the general structure of Blockchain and users in the domain of education. There are several uses and advantages of using blockchain technology in the field of education:

## 6.1. Online Education

Online education, also known as distance learning or electronic learning, uses data and internet technology to deliver information and facilitate learning. It's referred to as a web-based learning technique. With blockchain invention, an ideal solution to online learning issues, such as legitimacy and protection, will be offered. The Blockchain will also create non-modifiable learning documents for online teaching without the need for third-party oversight, ensuring that course credits are adequately recognized.

## 6.2. Student records

Academic transcripts are one of the most time-consuming and labour-intensive processes in higher education. Each entry must be manually checked for authenticity before a validated record of a student's grades is available. Course content certification is another type of student record that is often sought. Each page should be signed and stamped for each student who requests this record (to ensure accuracy). If material courses and academic accomplishments were stored on a blockchain, an individual could get an accurate, authenticated record with just a few taps.

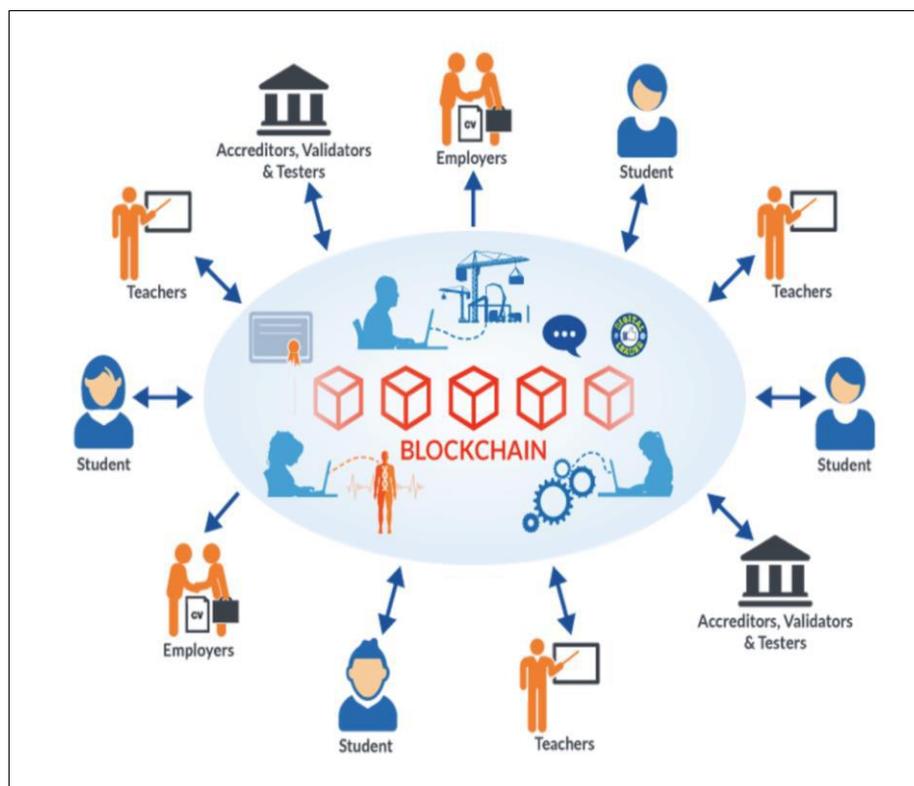


Figure 1.2: Blockchain in Education

### 6.3. Diplomas and certificates

Diplomas and certificates for students could be provided and stored on a blockchain, much like grades. Employers will then need to be given a referral to a digital certificate instead of requiring the agency that issued the diploma to certify a paper copy. It is also in progress. Since most of the available instructive credential administrations are unable to guarantee the confidentiality and reliability of student data. Although using Blockchain to address confidence problems could be a viable solution, Blockchain has drawbacks that limit its complete adoption. Small throughput and access time are found in Blockchain. It stops users from using fake degrees or certificates to possible employers or institutions for higher education.

### 6.4. Student Examination and Evaluation

Students will then take the test remotely using personal computers or smartphones, with the Blockchain performing the evaluation. Teachers would have more time to devote to other scholarly or cultural pursuits if they didn't have to grade tests. Teachers can use smart contract and Blockchain with defining the correct answers and scoring criteria for evaluation. Student's will then appear for the examination on their PC or devices. Students' academic success and academic successes in education, preparation, tournaments, work, and other events outside of school can be measured using blockchain technologies to assess their capability, which benefits both students and businesses looking to hire them. A blockchain-based student technical skill assessment system that can test student ability measurement methods using a clustering algorithm. The framework can also allow for the development of a student skill assessment ecosystem.

### 6.5. Lessons and courses.

Many blockchains also support smart contracts. It ensures that lessons and courses can be coded into the Blockchain and run spontaneously when those criteria are encountered. An instructor may assign students assignments. The smart contracts on the Blockchain could verify the execution of each mission automatically. Teachers could be paid in crypto tokens for finishing all assignments, and students can get credits. This method may be used to layout whole classes also.

### 6.6. Intellectual property protection and Publishing

Undergraduate and graduate students, instructors, scholars, and researchers actively produce high-quality content, but getting it published is difficult. Although growth in the amount and types of ways to publish academic work, questions about peer review accuracy, plagiarism, the lack of

audience and patient participation, publication prejudice, predatory reporting, the expense of open access publishing, and the opacity of science research's "pedigree" remain.

Academic transparency, reproducibility, and the prevention of evidence falsification and manipulation are all at the centre of debates aimed at preserving public interest in the scientific method. Blockchain can sort out these issues.

### 6.7. Admission Process

Most educational institutions operate based on a model in which they have authority over students' records and qualifications. As a result, there's a chance the data will be changed, lost, or destroyed. Data can be securely shared to interested parties using distributed ledger technologies running on a decentralized network. It will also help to prevent theft. It will inspire students to adopt mobile learning modes, as they will be able to effectively complete the admission requirements of various universities around the world.

### 6.8. Benefits of blockchain technology in education

Blockchain technology is an innovative new field of blockchain technology with a lot of potentials to transform the education industry. The advantages of blockchain technology in education range from data management to data authentication without jeopardizing legitimacy. The blockchain data is accessible and verifiable 24 hours a day, seven days a week, with complete accountability. Blockchain technology is commonly used to issue and authenticate educational credentials such as degrees, transcripts, and students' competencies, qualifications, and technical abilities, which employers can check all over the world. The credential process is streamlined thanks to blockchain technologies, and employers can expend less time verifying academic performance. It supports the education sector by offering a secure forum for sharing student data, increasing confidence, lowering costs, and increasing accountability. Blockchain technology holds a complete record of the course in data blocks that are ordered by timestamps in a chronological sequence. The cryptographic algorithm avoids computer tampering and frauds by preventing the deletion of old and new data blocks. It creates a virtual infrastructure for paper collection and keeps track of students' qualifications and accomplishments throughout their lives.

## 7. Blockchain-based Framework for Digital Credential in Education

Online qualifications have everything from digital badges to digital certificates. In the online environment, the alternative for paper-based qualifications, medals, and prizes. It's easy to give,

maintain, and check digital credentials. Degrees from educational institutions, recognition for completing a course or subject, and awards for acquiring a personal or technical competence are some of the most popular examples. Digital certificates denote and convey valuable knowledge regarding the credential holder's competence, and the agency or entity that verifies that competency. University transcripts will become increasingly outdated and useless as a result of digital certificates.

Although employers will continue to value degree completion, transcript entries of course grades are also unreferenced in the career application process. Digital credentialing has benefits in terms of tracking and disseminating comprehensive learning accomplishments.

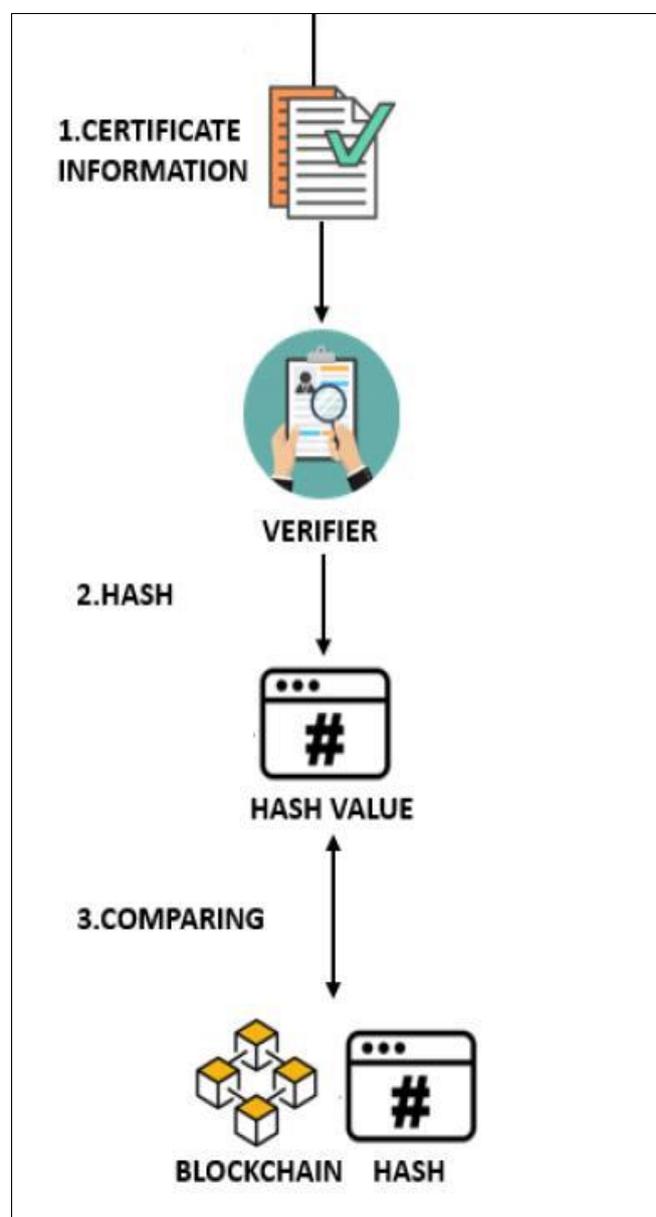


Figure 1.3: Digital Certificate verification process using Blockchain

## **Chapter - 4**

# **SYSTEM REQUIREMENT SPECIFICATION**

### **4.1 INTRODUCTION:**

Software Requirement Specification (SRS) is the starting point of the software developing activity. As the system grew more complex, it became evident that the goal of the entire system cannot be easily comprehended. Hence the need for the requirement phase arose. The software project is initiated by the client needs. The SRS is the means of translating the ideas of the minds of clients (the input) into a formal document (the output of the requirement phase).

The SRS phase consists of two basic activities:

#### **1. Problem/Requirement Analysis:**

The process is order and more nebulous of the two, deals with understanding the problem, the goal and constraints.

#### **2. Requirement Specification:**

Here, the focus is on specifying what has been found giving analysis such as representation, specification languages and tools, and checking the specifications are addressed during this activity.

The Requirement phase terminates with the production of the validate SRS document. Producing the SRS document is the basic goal of this phase.

### **ROLE OF SRS:**

The purpose of the Software Requirement Specification is to reduce the communication gap between the client and the developers. Software Requirement Specification is the medium through which the client and user needs are accurately specified. It forms the basis of software development. A good SRS should satisfy all the parties involved in the system.

## FUNCTIONAL REQUIREMENTS

There will be registration part where admin can add particular students to the apk module. Through which students can download digital certificates. In this application, we take the student details like, user name, phone number and email.

## NON-FUNCTIONAL REQUIREMENTS

### Usability

The software must have a simple, user-friendly interface so customers can save time and confusion.

### Flexibility

The Interface design is aimed at a flexible front-end communication to provide the user with clear information in navigating a user-friendly interface is planned.

## System Requirements

The system exhibits high performance because it is well optimized.

### Software Requirements

Operating system	: Windows 7,8,10 Ultimate, Linux, Mac.
Front-End	: Android.
Coding Language	: Java.
Software Environment	: Android Studio.

### Hardware Requirements

System	: Dual core
Hard Disk	: 20 GB
RAM	: 1GB
Processor	: Intel core i5, i7

## 4.2 MODULES

- **Module 1: Admin**
- **Module 2: Verifier**
- **Module 3: Student**

### Module 1: Admin

- In our application the first page is admin login, the next page consists of add student and certificate and last verifier page
- The admin can log in to our application using the admin login id and password
- Then the admin can add the student and their certificates by tap the add student and add certificate button

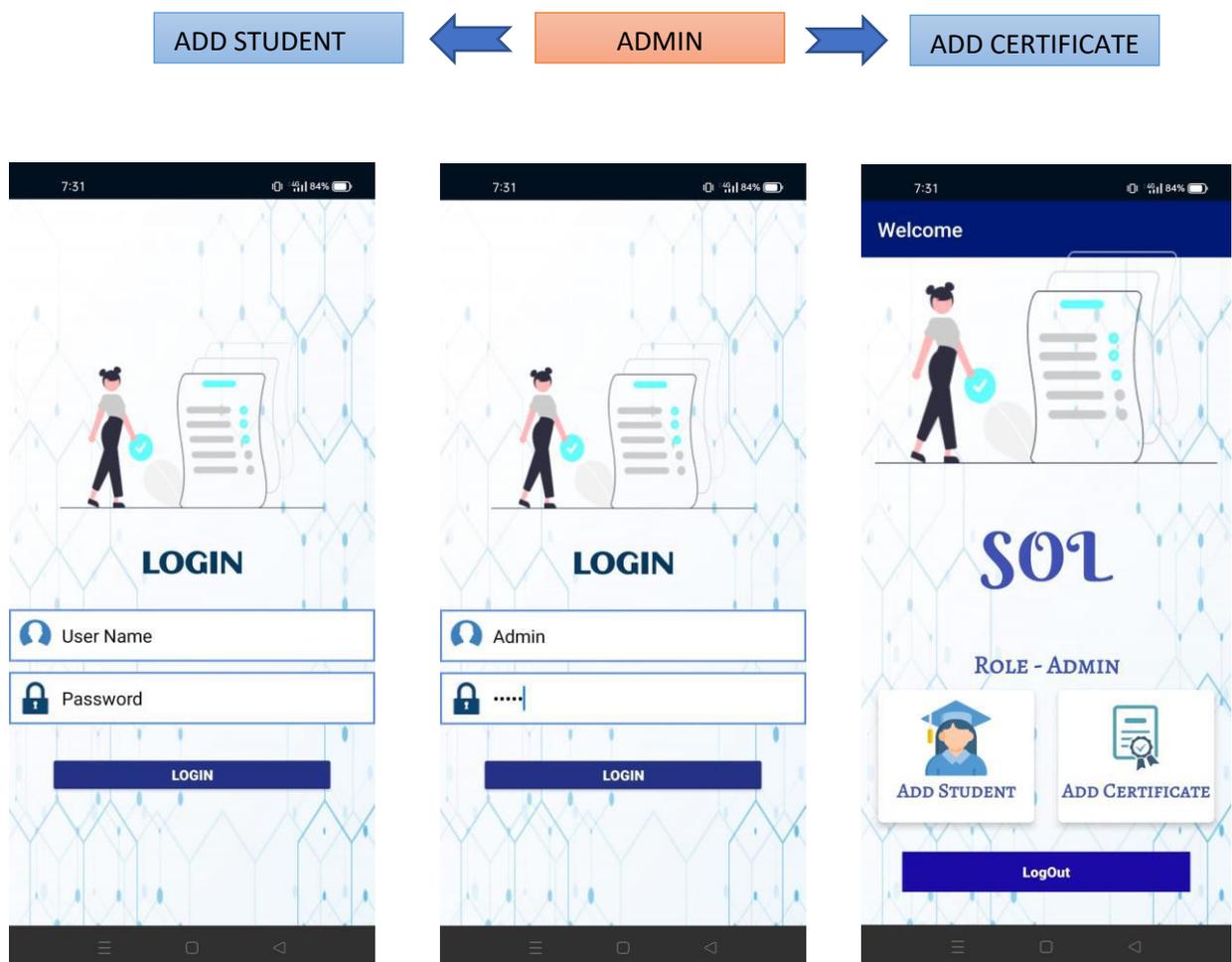


Figure 1.4: Proposed System Admin Front-End

## Module 2 : Verifier

- The verifier can validate the certificate using the verifier login id and password.
- They provide the login id of the student and select the certificate type and tap the verify button. If the uploaded certificates are original then the result will be a success. Otherwise, the result will be error and modified.
- Certificates that are stored in the blockchain are validated by matching the hash value.

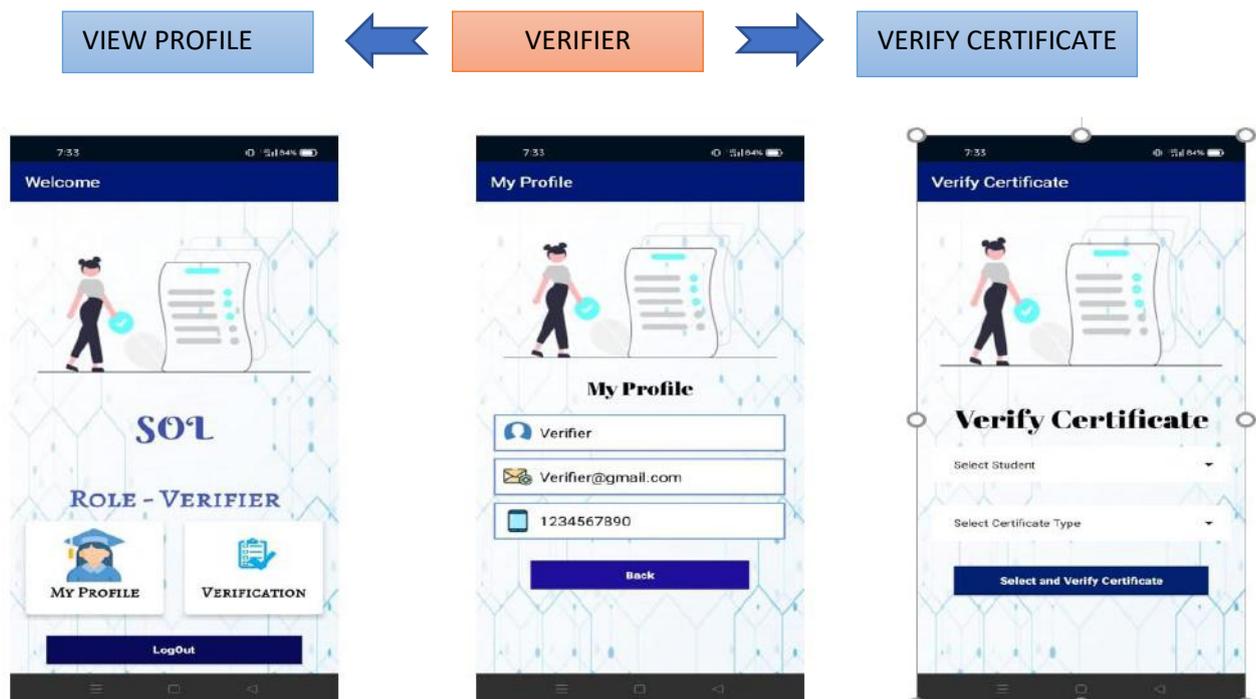
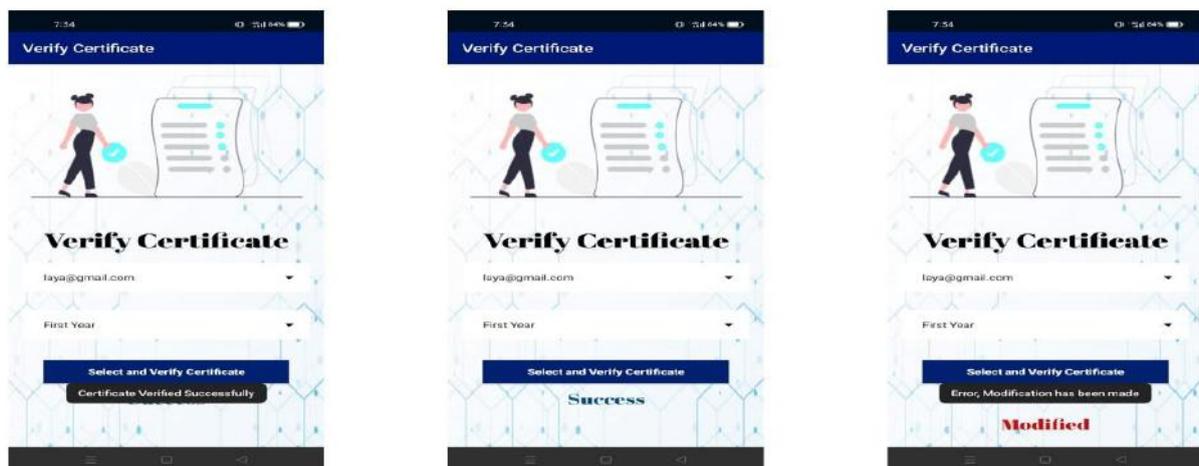


Figure 1.5: Proposed System Verifier Front-End



### Module 3 : Student

- The Student can log in to our application using the login id and password, where they can view student profile and can download the certificate which is uploaded by the admin. verifier can validate the certificate using the verifier login id and password.

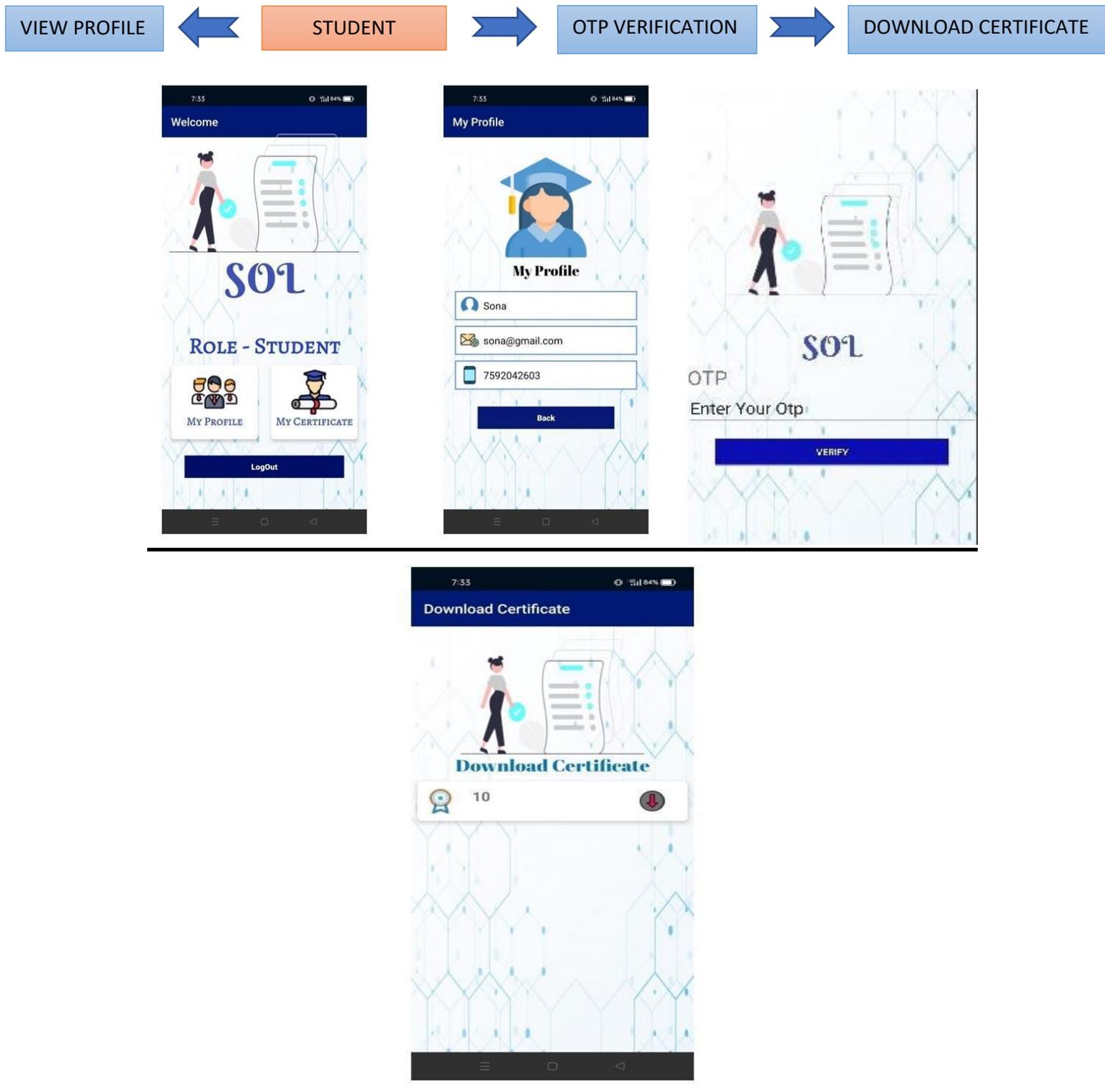


Figure 1.6: Proposed System Student Front-End

## **Chapter - 5**

# **SYSTEM DESIGN**

### **5.1 INTRODUCTION**

System design is the process, which involves conceiving planning and carrying out the plan by generating the necessary reports and inputs. In other words design phase acts as a bridge between the software requirement specification and implementation phase, which satisfies those requirements. System Design is the transformation of the analysis model into a system design model.

The design of a system is correct if a system built precisely according to the requirements of that system. Design should be clearly verifiable, complete and traceable. The goal is to divide the problem into manageably small modules that can be solved separately. The different modules have to cooperate and communicate together to solve the problem. The complete project is broken down into different identifiable modules. Each module can be understood separately. All the modules at last are combined to get the solution of the complete system.

Software design sits in the technical kernel of the software engineering process and is applied regardless of the development paradigm and area of application. Design is the first step in the development phase for any engineered product or system. The designer's goal is to produce a model or representation of an entity that will later be built. Beginning, once system requirement has been specified and analyzed, system design is the first of the three technical activities -design, code and test that is required to build and verify software.

The importance can be stated with a single word "Quality". Design is the place where quality is fostered in software development. Design provides us with representations of software that can assess for quality. Design is the only way that we can accurately translate an employee's view into a finished software product or system. Software design serves as a foundation for all the software engineering steps that follow. Without a strong design we risk building an unstable system – one that will be difficult to test, one whose quality cannot be assessed until the last stage.

During design, progressive refinement of data structure, program structure, and procedural details are developed reviewed and documented. System design can be viewed from either technical or project management perspective. From the technical point of view, design is comprised of four activities – architectural design, data structure design, interface design and procedural design.

## MODULES USED

### User Interfaces

User interface design which we use to this project is android studio.

Using android studio we develop an android application to access certificates for students by using an OTP verification process and blockchain for the storage purpose.

### BlockCreation

A block is a container data structure. The average size of a block seems to be 1MB (source).

Here every certificates number will be created as a block.

For every block an hash code will generate for security.

### Android based Block chain code generation:

In this module, based on certificate numbers Block code will generate.

While creating Blockchain code user can increase the count based on their needs.

### Verification

In this module admin will upload the certificates like 10th mark list, plus two mark list , college certificates, government certificates and so on.

Before upload, those certificates will verified by the corresponding sector, if we upload school certificate, the certificate number will check with corresponds school database server if that certificate is verified manually after that it will stored on server otherwise it will discard.

## 5.1.1 NORMALIZATION

It is a process of converting a relation to a standard form. The process is used to handle the problems that can arise due to data redundancy i.e. repetition of data in the database, maintain data integrity as well as handling problems that can arise due to insertion, updating, deletion anomalies.

Decomposing is the process of splitting relations into multiple relations to eliminate anomalies and maintain anomalies and maintain data integrity. To do this we use normal forms or rules for structuring relation.

**Insertion anomaly:** Inability to add data to the database due to absence of other data.

**Deletion anomaly:** Unintended loss of data due to deletion of other data.

**Update anomaly:** Data inconsistency resulting from data redundancy and partial update

**Normal Forms:** These are the rules for structuring relations that eliminate anomalies.

**FIRST NORMAL FORM:**

A relation is said to be in first normal form if the values in the relation are atomic for every attribute in the relation. By this we mean simply that no attribute value can be a set of values or, as it is sometimes expressed, a repeating group.

**SECOND NORMAL FORM:**

A relation is said to be in the second Normal form if it is in first normal form and it should satisfy any one of the following rules.

- The Primary key is not a composite primary key
- No, non key attributes are present
- Every non key attribute is fully functionally dependent on a full set of primary key.

**THIRD NORMAL FORM:**

A relation is said to be in third normal form if there exists no transitive dependencies.

**Transitive Dependency:** If two non-key attributes depend on each other as well as on the primary key, then they are said to be transitively dependent.

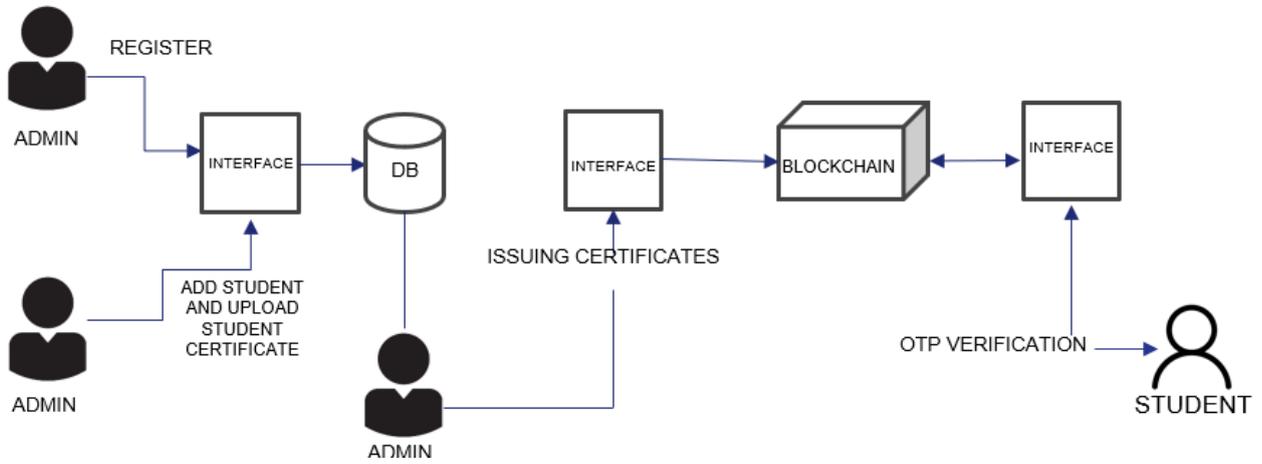
The above normalization principles were applied to decompose the data in multiple tables thereby making the data to be maintained in a consistent state.

**5.1.2 E-R Diagrams**

- The relation upon the system is structured through a conceptual ER-Diagram, which not only specifies the existing entities but also the standard relations through which the system exists and the cardinalities that are necessary for the system state to continue.
- The entity Relationship Diagram (ERD) depicts the relationship between the data objects. The ERD is the notation that is used to conduct the data modeling activity the attributes of each data object noted in the ERD can be described as a data object description.
- The set of primary components that are identified by the ERD are
  - Data object
  - Relationships
  - Attributes
  - Various types of indicators.

### 5.1.3 FLOW DIAGRAM

#### Admin:



#### Design Goals

The definition of design goals is the first step of system design. In our proposed system the goals identified are reliability, fault tolerance, security and modifiability. “Online Technical Support” should be reliable; fault tolerant to loss of connectivity of server as well as it should be secure and can be modified later by any software developers.

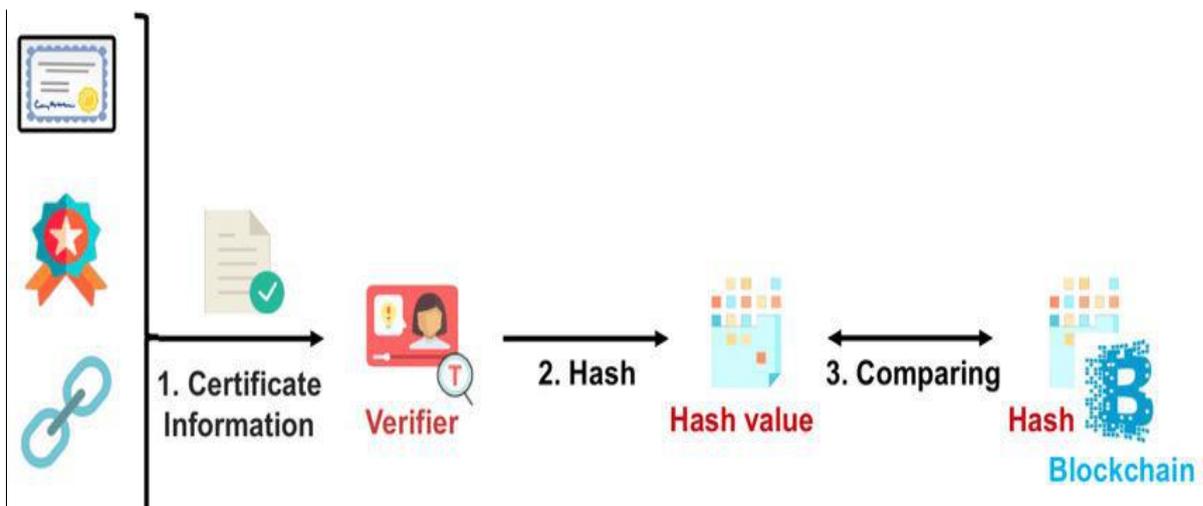


Figure 1.7: Verification Methodology

## 5.2 DATABASE DESIGN:

### 5.2.1 DATABASE

A database is a collection of data with some inherent meaning, designed, built and populated with data for a specific purpose.

A database management system provides flexibility in the storage and retrieval of data. The DBMS is a bridge between the application program, which determines what data are needed and how they are processed, and the operating system of the computer, which is responsible for placing data on the magnetic storage devices. A schema defines the database and a subschema defines the portion of the database that a specific program will use.

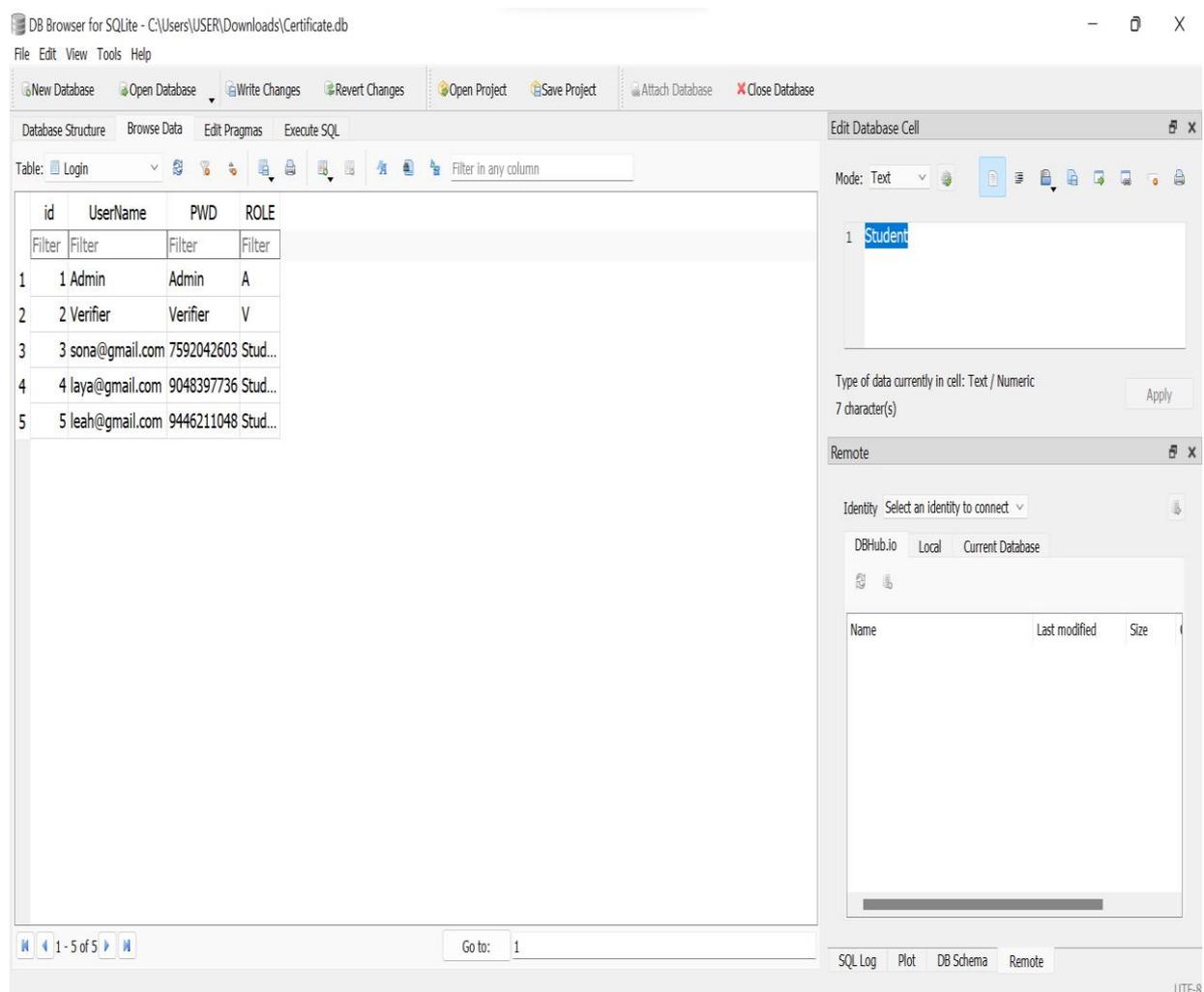


Figure 1.8: Database

## CHARACTERISTICS

- Represents complex relationships between data.
- Keeps a centralized data dictionary for the storage of information retaining to data and its manipulation.
- Keeps control on data redundancy.
- Enforces data access authorization.
- Has automatic intelligent backup and recovery Procedure for data.

### 5.2.2 DATABASE ADMINISTRATION

A database administrator is a block of code loaded into memory, which organizes all information (database) between the users.

The DBA takes care of the following things:

- Updating database
- Retrieving the data
- Accepting the queries
- Enforces security
- Enforces data integrity specifications
- Managing data sharing
- Optimizing queries
- Managing system catalogs.

### 5.2.3 UML DIAGRAMS

UML stands for Unified Modelling Language. UML is a standardized general- purpose modelling language in the field of object-oriented software engineering.

The standard is managed, and was created by, the Object Management Group. The goal is for UML to become a common language for creating models of object-oriented computer software. In its current form UML is comprised of two major components: a Meta-model and a notation. In the future, some form of method or process may also be added to; or associated with, UML. The Unified Modelling Language is a standard language for specifying, Visualization, Constructing and documenting the artifacts of software system, as well as for business modelling and other non-software systems

The UML represents a collection of best engineering practices that have proven successful in the modelling of large and complex systems.

The UML is a very important part of developing objects-oriented software and the software development process. The UML uses mostly graphical notations to express the design of software projects. Security Alert for Crime Prone Areas.

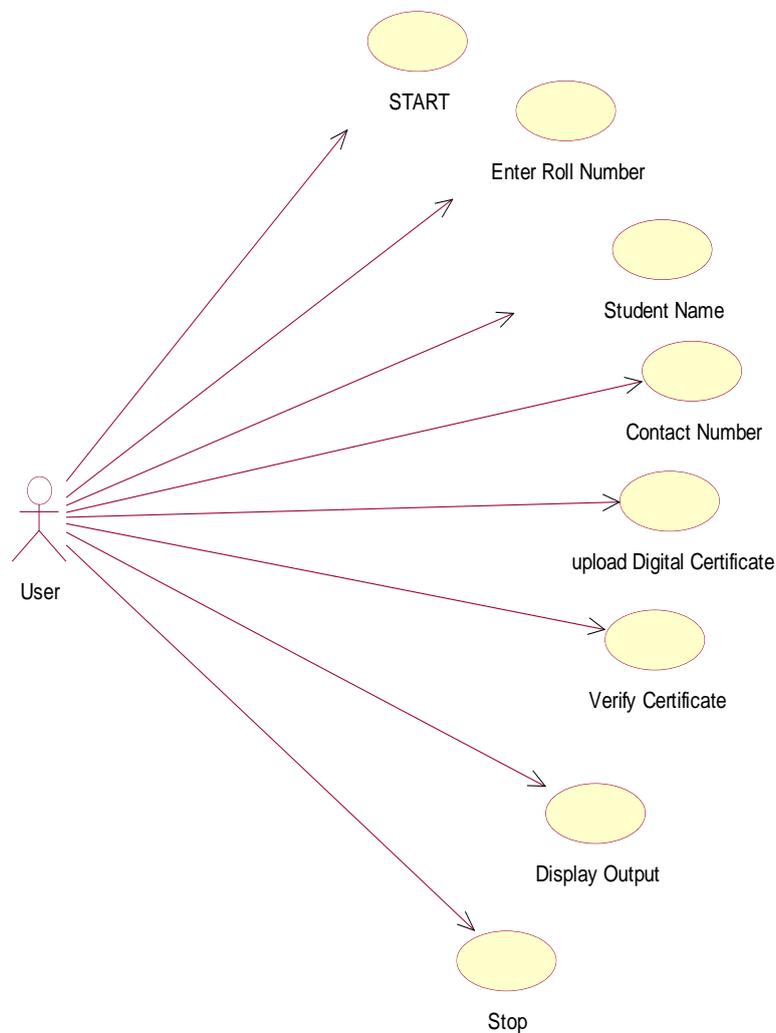
**Goals:** The Primary goals in the design of the UML are as follows:

- Provide users a ready-to-use, expressive visual modelling Language so that they can develop and exchange meaningful models.
- Provide extendibility and specialization mechanisms to extend the core concepts.
- Be independent of particular programming languages and development process.
- Provide a formal basis for understanding the modelling language.
- Encourage the growth of tools market.
- Support higher level development concepts such as collaborations, frameworks, patterns and components.
- Integrate best practices.

## DATA FLOW DIAGRAM

### 5.2.4 USE CASE DIAGRAM

UML provides the use case diagram to facilitate the process of requirements gathering. The use case diagram models the interactions between the system's external clients and the use cases of the system. Each use case represents a different capability that the system provides the client. A UML diagram is a diagram based on the UML (Unified Modeling Language) with the purpose of visually representing a system along with its main actors, roles, actions, artifacts or classes, in order to better understand, alter, maintain, or document information about the system.



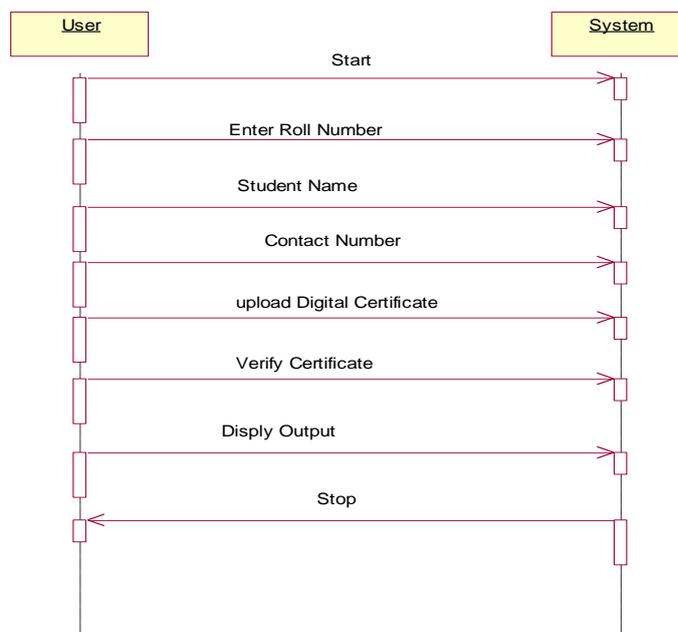
### 5.2.5 CLASS DIAGRAM

In software engineering, a class diagram in the Unified Modelling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations (or methods), and the relationships among the classes. It explains which class contains information.



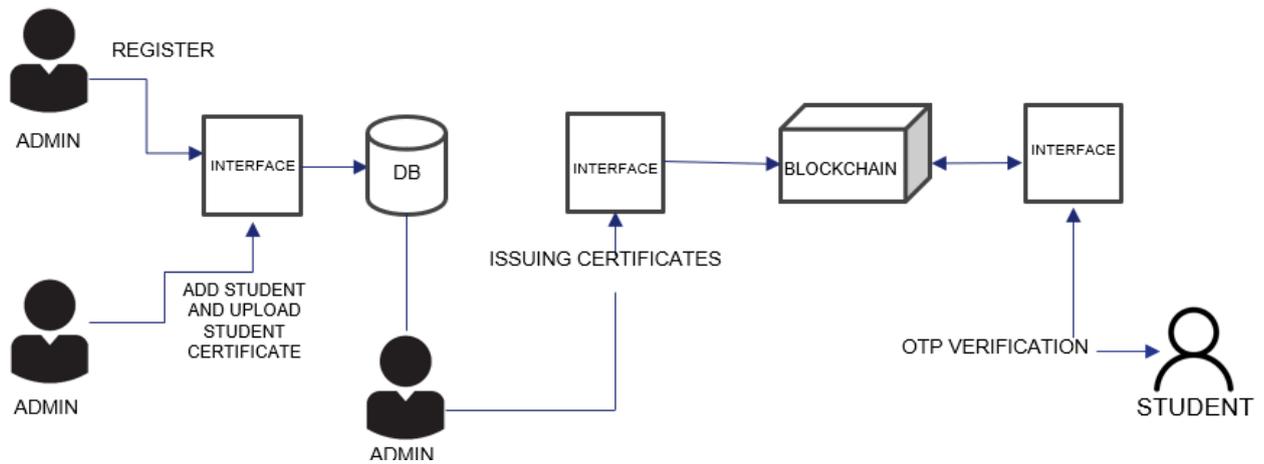
### 5.2.6 SEQUENCE DIAGRAM

A sequence diagram in Unified Modelling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. Sequence diagrams are sometimes called event diagrams, event scenarios, and timing diagrams.



### 5.2.7 ACTIVITY DIAGRAM

Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the Unified Modelling Language, activity diagrams can be used to describe the business and operational step-by-step workflows of components in a system. An activity diagram shows the overall flow of control.



## Chapter - 6

# IMPLEMENTATION

In this project we have designed following modules :

- 1) Save Certificate : Using this module admin user can upload student details and student academic certificate and then application convert certificate into digital certificate and then these certificates and other student details will be saved in Blockchain database.
- 2) Verify Certificate: In this module verifier or companies or admin will take certificate from student and then upload to application and then application will convert certificate into digital signature and this digital signature will get checked/verified at Blockchain database and if matched found then Blockchain will retrieve all student details and display to verifier and if match not found then this certificate will be consider as fake or forge.

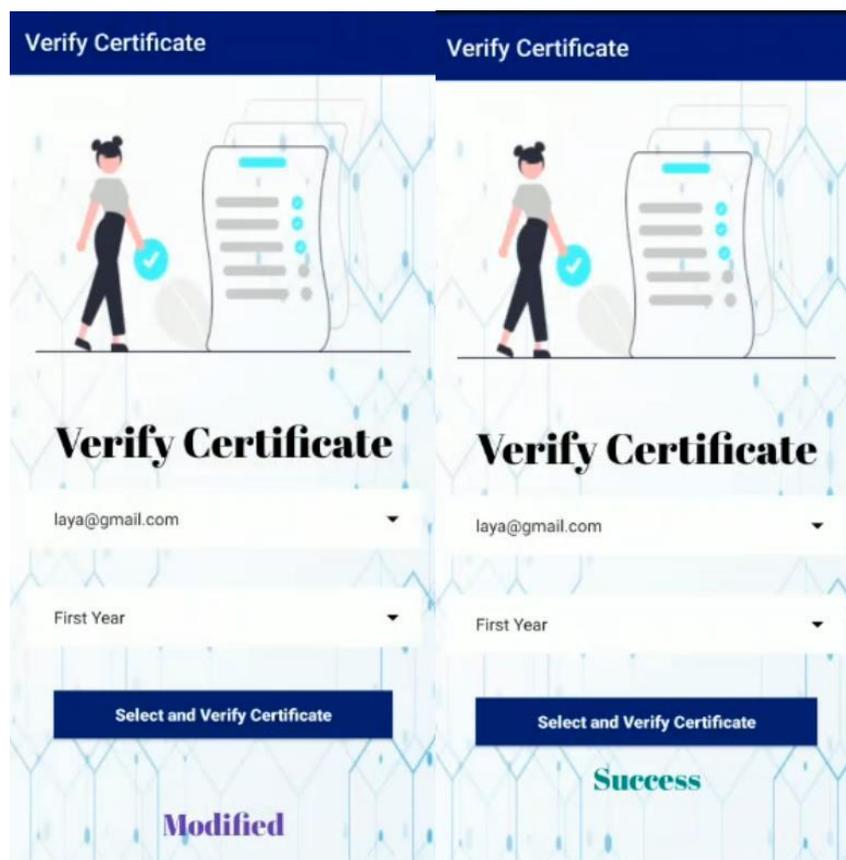


Figure 1.9: Certificate Verification

## **ABOUT THE SOFTWARE**

### **6.1 INTRODUCTION TO ANDROID :**

Android is a software stack for mobile devices that includes an operating system, middleware and key applications. Android is a software platform and operating system for mobile devices based on the Linux operating system and developed by Google and the Open Handset Alliance. It allows developers to write managed code in a Java-like language that utilizes Google-developed Java libraries, but does not support programs developed in native code.

The unveiling of the Android platform on 5 November 2007 was announced with the founding of the Open Handset Alliance, a consortium of 34 hardware, software and telecom companies devoted to advancing open standards for mobile devices. When released in 2008, most of the Android platform will be made available under the Apache free-software and open-source license.

### **6.2 THE BIRTH OF ANDROID**

#### **Google Acquires Android Inc.**

In July 2005, Google acquired Android Inc., a small startup company based in Palo Alto, CA. Android's co-founders who went to work at Google included Andy Rubin (co-founder of Danger), Rich Miner (co-founder of Wildfire Communications, Inc), Nick Sears (once VP at T-Mobile), and Chris White (one of the first engineers at WebTV). At the time, little was known about the functions of Android Inc. other than they made software for mobile phones.

At Google, the team, led by Rubin, developed a Linux-based mobile device OS which they marketed to handset makers and Binriers on the premise of providing a flexible, upgradeable system. It was reported that Google had already lined up a series of hardware component and software partners and signaled to Binriers that it was open to various degrees of cooperation on their part.

#### **Open Handset Alliance**

Founded On 5 November 2007, the Open Handset Alliance, a consortium of several companies which include Google, HTC, Intel, Motorola, Qualcomm, T-Mobile, Sprint Nextel and NVIDIA, was unveiled with the goal to develop open standards for mobile devices.

Along with the formation of the Open Handset Alliance, the OHA also unveiled their first product, Android, an open source mobile device platform based on the Linux operating system.

## **Hardware**

Google has unveiled at least three prototypes for Android, at the Mobile World Congress on February 12, 2008. One prototype at the ARM booth displayed several basic Google applications. A 'd-pad' control zooming of items in the dock with a relatively quick response.

A prototype at the Google IO conference on May 28, 2008 had a 528 MHz Qualcomm processor and a Synaptics capacitive touch screen, and used the UMTS cellular standard. It had 128 MB of RAM and 256 MB of flash, showing that Android's memory requirements are reasonable. The demo was Binried out using a 3.6 Mbit/s HSDPA connection.

## **FEATURES**

### **Application Framework**

It is used to write applications for Android. Unlike other embedded mobile environments, Android applications are all equal, for instance, an applications which come with the phone are no different than those that any developer writes. The framework is supported by numerous open source libraries such as openssl, SQLite and libc. It is also supported by the Android core libraries. From the point of security, the framework is based on UNIX file system permissions that assure applications have only those abilities that mobile phone owner gave them at install time.

### **Dalvik Virtual Machine**

It is extremely low-memory based virtual machine, which was designed especially for Android to run on embedded systems and work well in low power situations. It is also tuned to the CPU attributes. The Dalvik VM creates a special file format (.DEX) that is created through build time post processing. Conversion between Java classes and .DEX format is done by included “dx” tool.

## **Integrated Browser**

Google made a right choice on choosing WebKit as open source web browser. They added a two pass layout and frame flattening. Two pass layout loads a page without waiting for blocking elements, such as external CSS or external JavaScript and after a while renders again with all resources downloaded to the device. Frame flattening converts founded frames into single one and loads into the browser. These features increase speed and usability browsing the internet via mobile phone.

## **Optimized Graphics**

As Android has 2D graphics library and 3D graphics based on OpenGL ES 1.0, possibly we will see great applications like Google Earth and spectacular games like Second Life, which come on Linux version. At this moment, the shooting legendary 3D game Doom was presented using Android on the mobile phone.

## **SQLite**

Extremely small (~500kb) relational database management system, which is integrated in Android. It is based on function calls and single file, where all definitions, tables and data are stored. This simple design is more than suitable for a platform such as Android.

## **Handset Layouts**

The platform is adaptable to both larger, VGA, 2D graphics library, 3D graphics library based on OpenGL ES 1.0 specifications, traditional smart phone layouts. An underlying 2D graphics engine is also included. Surface Manager manages access to the display subsystem and seamlessly composites 2D and 3D graphic layers from multiple applications

## **Data Storage**

SQLite is used for structured data storage .SQLite is a powerful and lightweight relational database engine available to all applications.

## **Connectivity**

Android supports a wide variety of connectivity technologies including GSM, CDMA, Bluetooth, EDGE, EVDO, 3G and Wi-Fi.

## **Messaging**

SMS, MMS, and XMPP are available forms of messaging including threaded text messaging.

## **Web Browser**

The web browser available in Android is based on the open-source WebKit application framework. It includes LibWebCore which is a modern web browser engine which powers both the Android browser and an embeddable web view.

## **Java Virtual Machine**

Software written in Java can be compiled into Dalvik bytecodes and executed in the Dalvik virtual machine, which is a specialized VM implementation designed for mobile device use, although not technically a standard Java Virtual Machine.

## **Media Support**

Android will support advanced audio/video/still media formats such as MPEG-4, H.264, MP3, and AAC, AMR, JPEG, PNG, GIF.

## **Additional Hardware Support**

Android is fully capable of utilizing video/still cameras, touchscreens, GPS, compasses, accelerometers, and accelerated 3D graphics.

## **Development Environment**

Includes a device emulator, tools for debugging, memory and performance profiling, a plugin for the Eclipse IDE. There are a number of hardware dependent features, for instance, a huge media and connections support, GPS, improved support for Camera and simply GSM telephony.

## **CHAPTER – 7**

### **CONCLUSION**

In this paper, we proposed a solution to the problem of certificate forgery based on blockchain technology. Providing security to the data is very important. By using the unchallengeable property of blockchain, we can provide more security for data and reduce the certificate forgery. The application can allow the user to view and validate the certificate. This system guarantees information accuracy and security and easy for people to manage certificates.

## CHAPTER – 8

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## CHAPTER – 9

### APPENDIX

```
public class MainActivity extends AppCompatActivity {
    int PERMISSION_ALL = 1;
    boolean FileType;
    String[] PERMISSIONS = {
        Manifest.permission.READ_EXTERNAL_STORAGE,
        Manifest.permission.WRITE_EXTERNAL_STORAGE
    };
    DatabaseHelper db;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);

        if (!hasPermissions(this, PERMISSIONS)) {
            ActivityCompat.requestPermissions(this, PERMISSIONS, PERMISSION_ALL);
        }
        db = new DatabaseHelper(getApplicationContext());
    }

    public void Test(View view) {
        Intent intent = new Intent();
        intent.setAction(Intent.ACTION_GET_CONTENT);
        intent.setType("application/pdf");
        startActivityForResult(intent, 1212);
    }
}
```

```

@Override
protected void onActivityResult(int requestCode, int resultCode, Intent data) {
    switch (requestCode) {
        case 1212:
            if (resultCode == RESULT_OK) {
                Uri uri = data.getData();
                String uriString = uri.toString();
                File myFile = new File(uri.getPath());

                if (myFile.toString().endsWith(".pdf")) {
                    try {
                        InputStream is = getApplication().getContentResolver().openInputStream(uri);
                        byte[] byteArray = getBytes(is);
                        String checksum = getMD5EncryptedString(new String(byteArray, "UTF-8"));
                        //db.SaveCertificates("Test", byteArray, str);
                        //DownloadPDF(db.GetCertificateDetail());
                        Log.e("Checksum",checksum);
                    } catch (FileNotFoundException e) {
                        e.printStackTrace();
                    } catch (IOException e) {
                        e.printStackTrace();
                    }
                } else {
                    Toast.makeText(getApplicationContext(), "Wrong File Extension",
Toast.LENGTH_LONG);
                }
            }
            break;
        }
        super.onActivityResult(requestCode, resultCode, data);
    }
}

```

```
public void DownloadPDF(byte[] bytesArray)
{
    try {
        String path = getApplicationContext().getExternalFilesDir(null).getAbsolutePath();
        File myPdf = new File(path, "myPdf.pdf");
        FileOutputStream fos = new FileOutputStream(myPdf.getPath());
        fos.write(bytesArray);
        fos.close();
    } catch (Exception Ex)
    {

    }
}
```

```
public byte[] getBytes(InputStream inputStream) throws IOException {
    ByteArrayOutputStream byteBuffer = new ByteArrayOutputStream();
    int bufferSize = 1024;
    byte[] buffer = new byte[bufferSize];

    int len = 0;
    while ((len = inputStream.read(buffer)) != -1) {
        byteBuffer.write(buffer, 0, len);
    }
    return byteBuffer.toByteArray();
}
```

```
public static String getMD5EncryptedString(String encTarget){
    MessageDigest mdEnc = null;
    try {
        mdEnc = MessageDigest.getInstance("MD5");
    } catch (NoSuchAlgorithmException e) {
```

```
        System.out.println("Exception while encrypting to md5");
        e.printStackTrace();
    } // Encryption algorithm
    mdEnc.update(encTarget.getBytes(), 0, encTarget.length());
    String md5 = new BigInteger(1, mdEnc.digest()).toString(16);
    while ( md5.length() < 32 ) {
        md5 = "0"+md5;
    }
    return md5;
}

public static boolean hasPermissions(Context context, String[] permissions) {
    if (context != null && permissions != null) {
        for (String permission : permissions) {
            if(ActivityCompat.checkSelfPermission(context,permission)!=
PackageManager.PERMISSION_GRANTED) {
                return false;
            }
        }
    }
    return true;
}
}
```

**BLOCKCHAIN BASED BIOMETRICS  
TRAKER IN CLOUD**

**ST. TERESA'S COLLEGE (AUTONOMOUS)  
AFFILIATED TO MAHATMA GANDHI UNIVERSITY**



**PROJECT REPORT**

*In partial fulfilment of the requirements for the award of the degree of*

**BCA(CLOUD TECHNOLOGY AND INFORMATION  
SECURITY MANAGEMENT)**

*By*

**Fathima A - SB19BCA007**

**&**

**Leah Cicil Avin- SB19BCA010**

**III DC BCA (CLOUD TECHNOLOGY AND INFORMATION SECURITY  
MANAGEMENT)**

*Under the guidance of*

**Ms. Rishika K K**

**DEPARTMENT OF COMPUTER APPLICATIONS**

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## DECLARATION

We, undersigned hereby declare that the project report, **Blockchain Based Biometrics Tracker in Cloud**, submitted for partial fulfillment of the requirements for the award of degree of BCA St. Teresa's College (Autonomous), Ernakulam (Affiliated to Mahatma Gandhi University), Kerala is a bonafide work done by us under supervision of Ms. Rishika K K. This submission represents our ideas in our own words and where ideas or words of others have been included. We have adequately and accurately cited and referenced the original sources. We also declare that we have adhered to the ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or source in our submission. We understand that any violation of the above will be a cause for disciplinary action by the institute and/or the University and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not previously formed the basis for the award of any degree, diploma or similar title of any other University.

Ernakulam

March 2022

Fathima A - SB19BCA010

Leah Cicil Avin - SB19BCA010

**ST. TERESAS COLLEGE (AUTONOMOUS), ERNAKULAM**

**BCA (CLOUD TECHNOLOGY & INFORMATION SECURITY  
MANAGEMENT)**

**DEPARTMENT OF COMPUTER APPLICATIONS**



**CERTIFICATE**

This is to certify that the report entitled **Blockchain Based Biometrics Tracker in Cloud** submitted by **Fathima A** and **Leah Cicil Avin** to St. Teresa's College, Cochin in partial fulfillment of the requirements for the award of the Degree of BCA in CT & ISM is a bonafide record of the project work carried out by him/her under my/our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

*for* *Wichan*  
*4/4/22*

RISHIKA K K

Internal Supervisor



For Head of the Department

*[Signature]*  
*4/4/22*

External Supervisor

## ACKNOWLEDGEMENT

First and foremost we thank God Almighty for his blessings. We take this opportunity to express our gratitude to all those who helped us in completing this project successfully. We wish to express our sincere gratitude to the Manager **Rev. Dr. Sr. Vinitha CSST**, Director **Rev. Sr. Emeline CSST** and the Principal **Dr. Lizzy Mathew** for providing all the facilities.

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We are indebted to our beloved teachers whose cooperation and suggestion throughout the project helped us a lot. We thank all our friends and classmates for their support.

We convey our hearty thanks to our parents for the moral support, suggestion and encouragement.

## **ABSTRACT**

Biometric identification has become increasingly popular in recent years. With the development of cloud computing, database owners are motivated to outsource the large size of biometric data and identification tasks to the cloud to get rid of the expensive storage and computation costs, which however brings potential threats to users' privacy. A biometric based identity document replaces the need of a physical ID and serves as an undeniable proof of citizen's identity. By providing fingerprint based identity documents, government is able to create a safe environment as well as ensure proper access of services and welfare to citizens. The blockchain can provide a solution to this problem as in the decentralized system multiple copies of the same data are stored on multiple computer nodes which removes the possibility of failure of the complete system if one server fails. Blockchain helps construct a decentralized and distributed trust model that allows more transparency. Public blockchain allows every action to be visible and eliminates the hampering of data. Data once stored on the blockchain cannot be just changed by any person.

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# CHAPTER - 1

## INTRODUCTION

### 1.1 Blockchain

Blockchain is the backbone Technology of Digital CryptoCurrency BitCoin. The blockchain is a distributed database of records of all transactions or digital event that have been executed and shared among participating parties. Each transaction verified by the majority of participants of the system. It contains every single record of each transaction. BitCoin is the most popular cryptocurrency an example of the blockchain. Blockchain Technology first came to light when a person or Group of individuals name 'Satoshi Nakamoto' published a white paper on "BitCoin: A peer to peer electronic cash system" in 2008. Blockchain Technology Records Transaction in Digital Ledger which is distributed over the Network thus making it incorruptible. Anything of value like Land Assets, Cars, etc. can be recorded on Blockchain as a Transaction. Blockchain enhances trust across a business network. It's not that you can't trust those who you conduct business with its that you don't need to when operating on a Blockchain network.

Blockchain builds trust through the following five attributes:

**Distributed:** The distributed ledger is shared and updated with every incoming transaction among the nodes connected to the Blockchain. All this is done in real-time as there is no central server controlling the data.

**Secure:** There is no unauthorized access to Blockchain made possible through Permissions and Cryptography.

**Transparent:** Because every node or participant in Blockchain has a copy of the Blockchain data, they have access to all transaction data. They themselves can verify the identities without the need for mediators.

**Consensus-based:** All relevant network participants must agree that a transaction is valid. This is achieved through the use of consensus algorithms.

**Flexible:** Smart Contracts which are executed based on certain conditions can be written into the platform. Blockchain Network can evolve in pace with business processes.

**Benefits of Blockchain Technology:**

**Time-saving:** No central Authority verification needed for settlements making the process faster and cheaper.

**Cost-saving:** A Blockchain network reduces expenses in several ways. No need for third-party verification. Participants can share assets directly. Intermediaries are reduced. Transaction efforts are minimized as every participant has a copy of shared ledger.

Tighter security: No one can temper with Blockchain Data as it shared among millions of Participant. The system is safe against cybercrimes and Fraud.

## 1.2 Cloud Storage

Cloud storage allows you to save data and files in an off-site location that you access either through the public internet or a dedicated private network connection. Data that you transfer off-site for storage becomes the responsibility of a third-party cloud provider. The provider hosts, secures, manages, and maintains the servers and associated infrastructure and ensures you have access to the data whenever you need it.

Cloud storage delivers a cost-effective, scalable alternative to storing files on on-premise hard drives or storage networks. Computer hard drives can only store a finite amount of data. When users run out of storage, they need to transfer files to an external storage device. Traditionally, organizations built and maintained storage area networks (SANs) to archive data and files. SANs are expensive to maintain, however, because as stored data grows, companies have to invest in adding servers and infrastructure to accommodate increased demand.

Cloud storage services provide elasticity, which means you can scale capacity as your data volumes increase or dial down capacity if necessary. By storing data in a cloud, your organization save by paying for storage technology and capacity as a service, rather than investing in the capital costs of building and maintaining in-house storage networks. You pay for only exactly the capacity you use. While your costs might increase over time to account for higher data volumes, you don't have to overprovision storage networks in anticipation of increased data volume.

Cloud storage is available in private, public and hybrid clouds.

Public storage clouds: In this model, you connect over the internet to a storage cloud that's maintained by a cloud provider and used by other companies. Providers typically make services accessible from just about any device, including smartphones and desktops and let you scale up and down as needed.

Private cloud storage: Private cloud storage setups typically replicate the cloud model, but they reside within your network, leveraging a physical server to create instances of virtual servers to increase capacity. You can choose to take full control of an on-premise private cloud or engage a cloud storage provider to build a dedicated private cloud that you can access with a private connection. Organizations that might prefer private cloud storage include banks or retail companies due to the private nature of the data they process and store.

Hybrid cloud storage: This model combines elements of private and public clouds, giving organizations a choice of which data to store in which cloud. For instance, highly regulated data subject to strict archiving and replication requirements is usually more suited to a private cloud environment, whereas less sensitive data (such as email that doesn't contain business secrets) can be stored in the public cloud. Some organizations use hybrid clouds to supplement their internal storage networks with public cloud storage.

The advantages of cloud storage include the following:

**Off-site management:** Your cloud provider assumes responsibility for maintaining and protecting the stored data. This frees your staff from tasks associated with storage, such as procurement, installation, administration, and maintenance. As such, your staff can focus on other priorities.

**Quick implementation:** Using a cloud service accelerates the process of setting up and adding to your storage capabilities. With cloud storage, you can provision the service and start using it within hours or days, depending on how much capacity is involved.

**Cost-effective:** As mentioned, you pay for the capacity you use. This allows your organization to treat cloud storage costs as an ongoing operating expense instead of a capital expense with the associated upfront investments and tax implications.

**Scalability:** Growth constraints are one of the most severe limitations of on-premise storage. With cloud storage, you can scale up as much as you need. Capacity is virtually unlimited.

**Business continuity:** Storing data offsite supports business continuity in the event that a natural disaster or terrorist attack cuts access to your premises.

Cloud storage disadvantages include the following:

**Security:** Security concerns are common with cloud-based services. Cloud storage providers try to secure their infrastructure with up-to-date technologies and practices, but occasional breaches have occurred, creating discomfort with users.

**Administrative control:** Being able to view your data, access it, and move it at will is another common concern with cloud resources. Offloading maintenance and management to a third party offers advantages but also can limit your control over your data.

**Latency:** Delays in data transmission to and from the cloud can occur as a result of traffic congestion, especially when you use shared public internet connections. However, companies can minimize latency by increasing connection bandwidth.

**Regulatory compliance:** Certain industries, such as healthcare and finance, have to comply with strict data privacy and archival regulations, which may prevent companies from using cloud storage for certain types of files, such as medical and investment records. If you can, choose a cloud storage provider that supports compliance with any industry regulations impacting your business.

Clever Cloud is a Europe-based PaaS company. They help developers deploy and run their apps with bulletproof infrastructure, automatic scaling, fair pricing and other cool features. Their aim to make an easy-to-use service, without any vendor lock-in and able to grow with your needs.

## CHAPTER - 2

### LITERATURE SURVEY

There are some papers regarding the blockchain based biometrics tracker in cloud. These papers helped us to learn and understand the thing more deeply. They gave clear ideas about various types of techniques and methods they followed and advantages and disadvantages of those models. Here we are discussing some papers which are related to our work.

**AuthPrivacyChain: A Blockchain-Based Access Control Framework With Privacy Protection in Cloud** - This uses the account address of the node in blockchain as the identity, and at the same time, redefine the access control permission of data for the cloud, which is encrypted and stored in blockchain. After that, they design processes of access control, authorization, and authorization revocation in AuthPrivacyChain. Finally, implement AuthPrivacyChain based on enterprise operation system (EOS), and the results show that AuthPrivacyChain can not only prevent hackers and administrators from illegally accessing resources, but also protect authorized privacy.

**Industry 4.0 and Health: Internet of Things, Big Data, and Cloud Computing for Healthcare 4.0** - In this paper (i) a description of the main technologies and paradigms in relation to Healthcare 4.0 and discuss (ii) their main application scenarios; then provide an analysis of (iii) carried benefits and (iv) novel cross-disciplinary challenges; finally extract the lessons learned using cloud.

**Lightweight Sharable and Traceable Secure Mobile Health System** - Here, it propose a Lightweight Sharable and Traceable (LiST) secure mobile health system in which patient data are encrypted end-to-end from a patient's mobile device to data users. LiST enables efficient keyword search and fine-grained access control of encrypted data, supports tracing of traitors who sell their search and access privileges for monetary gain, and allows on-demand user revocation. LiST is lightweight in the sense that it offloads most of the heavy cryptographic computations to the cloud while only lightweight operations are performed at the end user devices.

**Collaborate Edge and Cloud Computing with Distributed Deep Learning for Smart City Internet of Things** - Here, the heterogeneity of edge and central cloud servers in the offloading destination selection. To jointly optimize the system utility and the bandwidth allocation for each mobile device, a hybrid offloading model including the collaboration of MCC and MEC. A Distributed Deep learning-driven Task Offloading (DDTO) algorithm is proposed to generate near-optimal offloading decisions over the mobile devices, edge cloud server and central cloud server.

**Detecting Blockchain Security Threats** - This system a data processing pipeline is proposed to aggregate log information from relevant blockchain components, enriched with data from external sources. To evaluate the feasibility of monitoring current blockchain frameworks, we determine relevant data sources in Hyperledger Fabric. Our results show that the required data is mostly available, but also highlight significant improvement potential with regard to threat intelligence, chaincode scanners and built-in metrics.

**Traceability in Permissioned Blockchain** - Here, the traceability of assets in a permissioned blockchain connected with a permissionless blockchain. We make traceability of assets in the permissioned blockchain be defined and be expressed as a hidden Markov model. There exists no dishonest increase and decrease of assets in this model. The condition is called balance. As they encrypt this model with fully homomorphic encryption and apply the zero knowledge proof of plaintext knowledge, we show that the traceability and balance of the permissioned blockchain are able to be proved in zero knowledge to the permissionless blockchain with concealing the asset allocation of the permissioned blockchain.

**IoT Application Modules Placement and Dynamic Task Processing in Edge-Cloud Computing** -Here, they propose the following solutions to resolve the different requests of the IoT device: In an “edge-cloud” heterogeneous network environment, create a mapping scheme between application modules and basic resource equipment, considering the two factors of tolerant task latency and system power consumption; In the application step-by-step execution process, heuristic dynamic task processing algorithm is used to reduce the task latency time. Experiments with the “iFogSim” simulator show that, application service quality is significantly improved and system power consumption is greatly reduced, which comparing with the stable application module placement strategy and the static task scheduling strategy.

## CHAPTER 3

# EXISTING SYSTEM

### 3.1. OVERVIEW

Cloud is a computing model that provides sharing and supports ubiquitous on-demand access computing, providing new data processing and services for many industries, significantly reducing user computing and storage costs, and improving ease of use. With the development of cloud-scale and intensification, cloud security has become an essential issue in the field of cloud computing. Access control is one of the critical security technologies for protecting sensitive data stored in the cloud by enterprises and individuals. Since the centralized access control mechanism is adopted in the cloud, the sensitive data in the cloud are easy to be tampered with or leaked by hackers or cloud internal managers. To address this issue, we propose a blockchain-based access control framework with privacy protection called AuthPrivacyChain. Firstly, we use the account address of the node in blockchain as the identity, and at the same time, redefine the access control permission of data for the cloud, which is encrypted and stored in blockchain. After that, we design processes of access control, authorization, and authorization revocation in AuthPrivacyChain. Finally, we implement AuthPrivacyChain based on enterprise operation system (EOS), and the results show that AuthPrivacyChain can not only prevent hackers and administrators from illegally accessing resources, but also protect authorized privacy.

### 3.2. DRAWBACK

If an authorised user sends the file/resource to another unauthorised user, the data owner won't be able to know about it.

## CHAPTER - 4

### PROPOSED SYSTEM

#### 4.1. OVERVIEW

In the proposed system, biometrics is the data to be stored using the techniques of blockchain and the whole database is stored in the cloud. The data owner will be able to know which all users have stored their biometric data in the system with their user ids and along with the time they stored the data.

#### 4.2. METHOD

In this project, biometrics data which is stored in blockchain and can be accessed by the data owner using the history in which the data owner can see which user stored their biometric in the system and at what time it was stored.

The data owner can reply to the feedbacks and view the list of users in the system. A user can register themselves onto the system and using their username and password they can login to the system. Once they have logged in they can store and secure their biometric in the system. the user can give feedback and get replies from the data owner. This biometric data is stored and secured using blockchain.

#### 4.3. ARCHITECTURE



## 4.4. SYSTEM WORKING

**Step 1:** First a user registers themselves into the system.

**Step 2:** After registering, they can login using their username and password.

**Step 3:** Once they are logged in, they can secure their biometric, here fingerprint, in the system.

**Step 4:** The user is given option to give feedback of the system and wait for the reply.

**Step 5:** The admin can view which all users have secured their biometrics in the system.

**Step 6:** The admin can also send replies for the feedback given by the user.

**Step 7:** The user can login to the system and see the reply from the admin

## **CHAPTER - 5**

# **SYSTEM REQUIREMENT SPECIFICATIONS**

### **➤ SOFTWARE REQUIREMENTS**

- Coding Platform
- Any Operating System ( Windows, Linux, etc.. )
- Clever Cloud

### **➤ HARDWARE REQUIREMENTS**

- Hard disk
- Monitor
- Keyboard
- Mouse
- Biometric Device

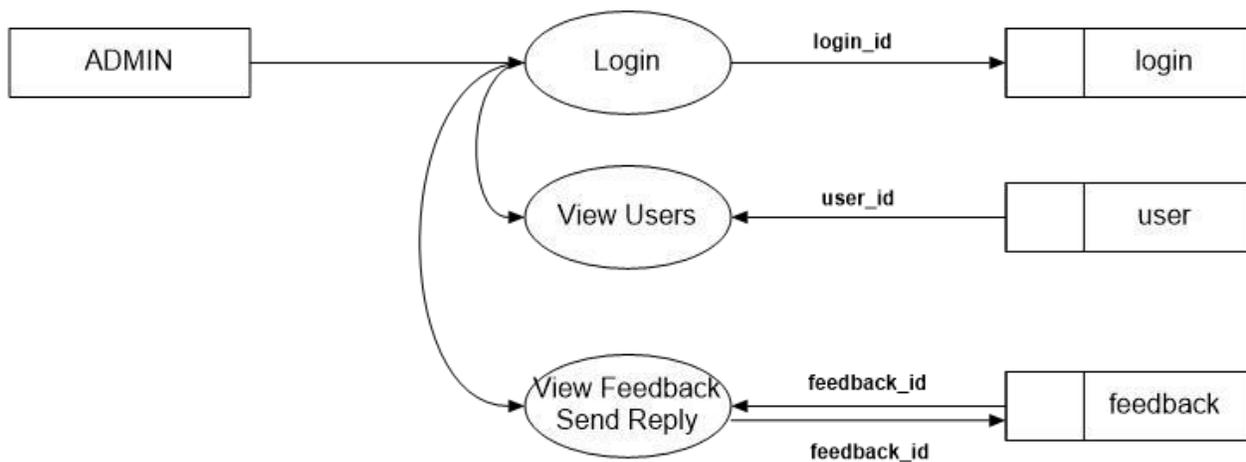
## CHAPTER 6 SYSTEM DESIGN ARCHITECTURE

### Level 0

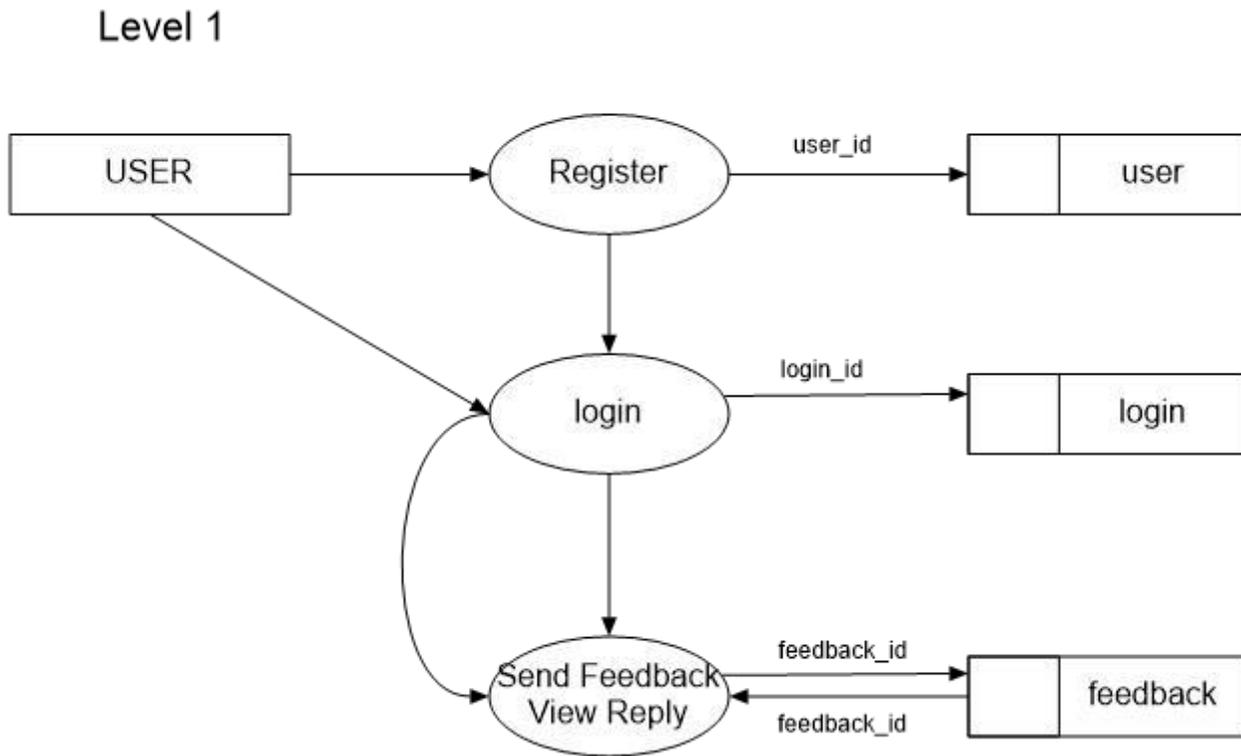


**Fig.No: 1** - Level 0 describes the basic working of our system. The admin request from the system and gets a response. The user also requests from the system and gets a response from the system.

### Level 1



**Fig.No: 2** - Here the Admin is already logged into the login table. The admin can view users using the user\_id from the user table, view feedback using the feedback\_id from the feedback table, and send reply to the users feedback using the feedback\_id from the feedback table.



**Fig.No.3** - The user is registered into the system using user\_id into the user table. The user can login into the login table using the login\_id. The user can send feedback which will be stored in the feedback table using feedback\_id and view replies from the admin using the feedback\_id.

## CHAPTER 7

### MODULE DESCRIPTION

The system consists of two modules:

- ❖ **Module 1: Admin**
- ❖ **Module 2: User**

#### **MODULE 1 : Admin**

The Admin is the data owner of the system. The Admin can view the users, view the feedback and send reply to the users feedback.

The admin can also track the users who are securing the biometrics in the system.

#### **MODULE 2 : User**

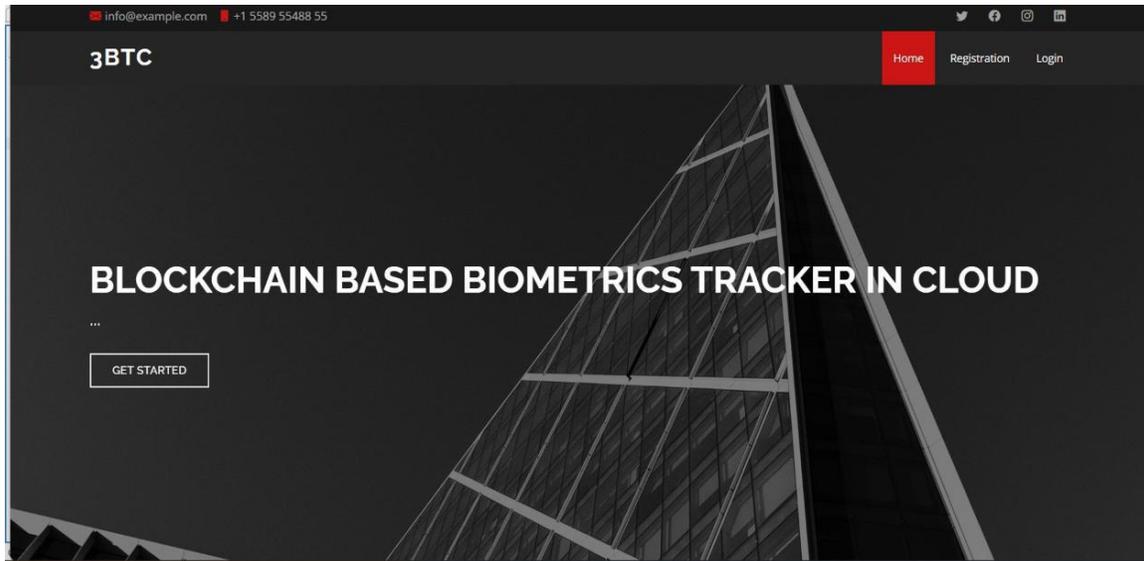
The User is registered into the system and is given a username and password with which they login to the system and store and secure their biometric. The user can send feedback and wait for the reply from the admin or the data owner.

## CHAPTER 8

# IMPLEMENTATION

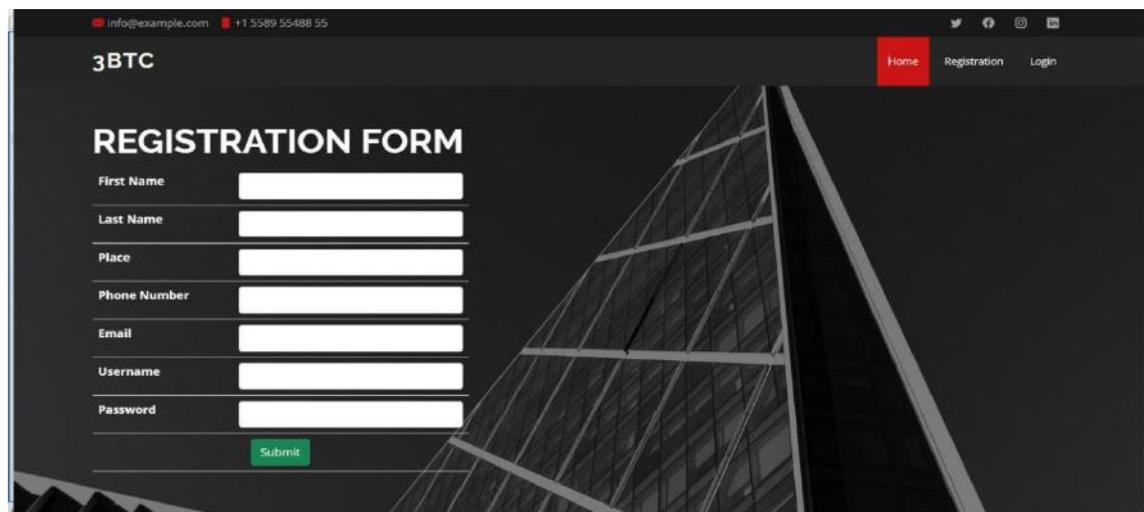
The user interface part :

The system is a web page hence it can be run on a web browser and is platform independent.



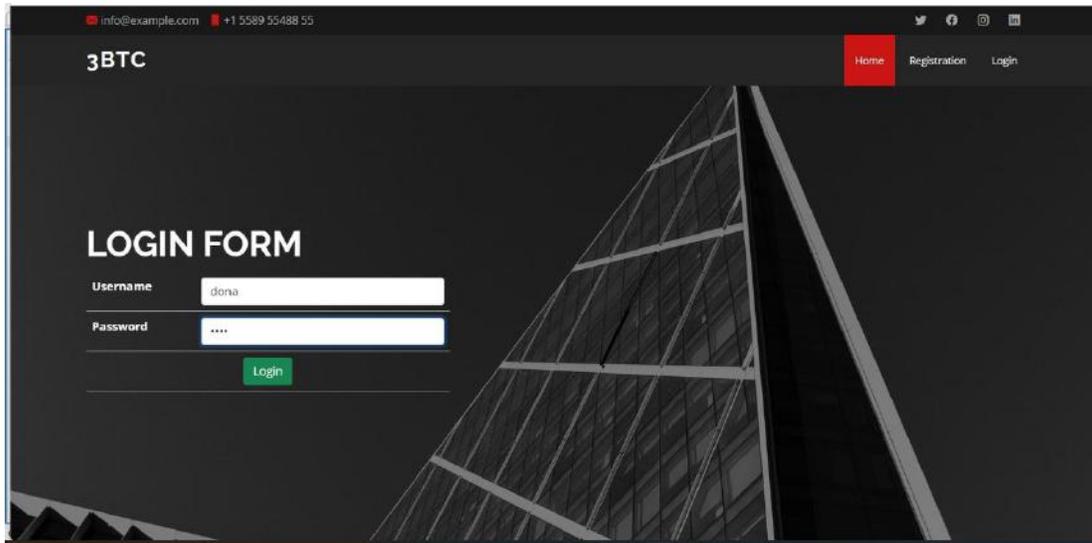
*Fig 8.1 User Interface of System*

In order to secure the fingerprint users have to do self registration. To register click on the Registration link at top right corner. There are some mandatory details to be filled by the user to complete registration.

A screenshot of the registration form on the system's website. The browser's address bar shows 'info@example.com' and '+1 5589 55488 55'. The page has a dark background with the same stylized building image as the homepage. In the top left corner, the text '3BTC' is visible. In the top right corner, there are navigation links: 'Home', 'Registration' (highlighted in red), and 'Login'. The main heading in the center reads 'REGISTRATION FORM'. Below the heading, there are several input fields for registration details: 'First Name', 'Last Name', 'Place', 'Phone Number', 'Email', 'Username', and 'Password'. Each field is represented by a white rectangular box. At the bottom of the form, there is a green 'Submit' button.

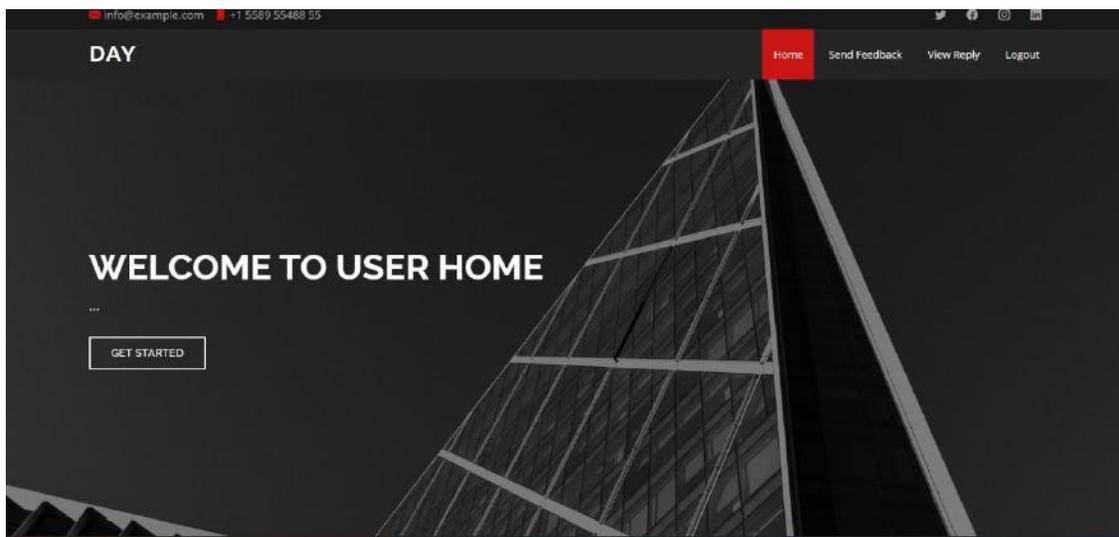
*Fig 8.2 Registration Form*

After registration the user can login to his/her account using his/her username and password which is given by user during registration process. To login click on Login option on the top right corner.



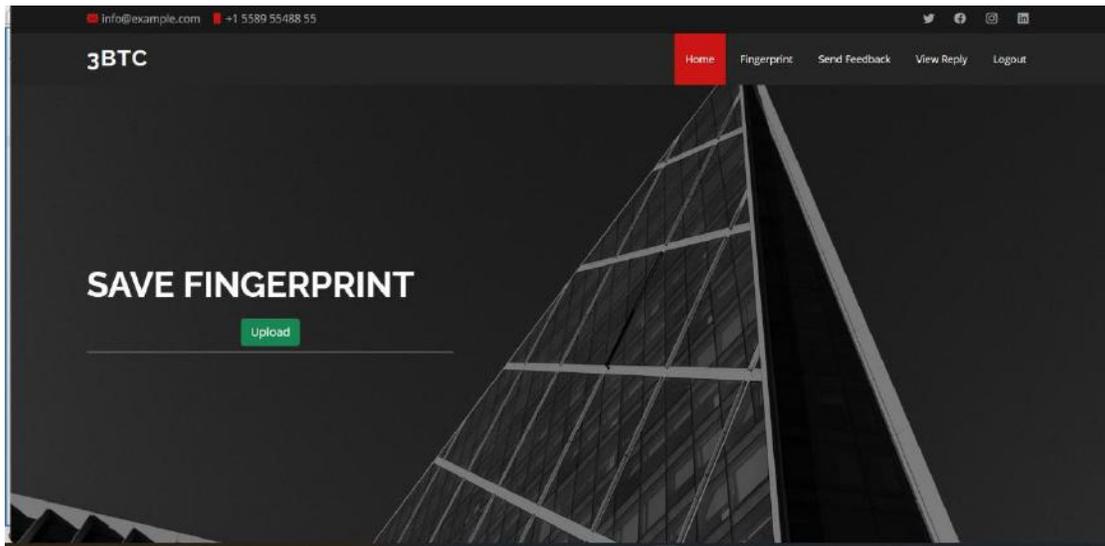
*Fig 8.3 Login Form*

After logging into the account the user is taken to the User Home page where the user has the options to secure fingerprint, send feedback to admin, view replies of the feedback from admin and to log out.



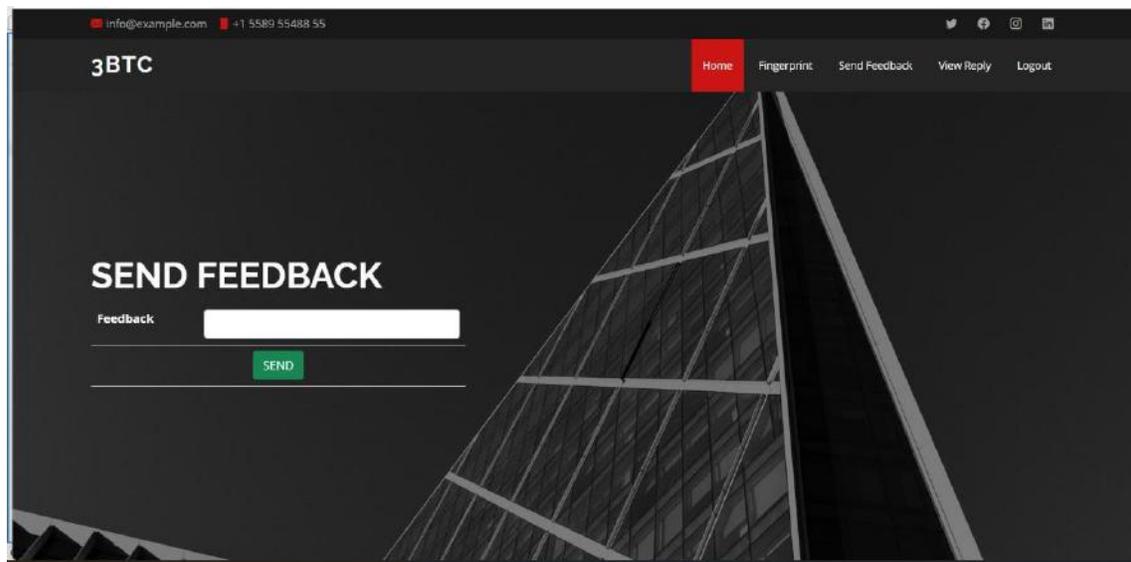
*Fig 8.4 User Home page*

To secure the fingerprint the user has to click on Fingerprint option on the top right corner. Place your finger on the biometric device and click on upload.



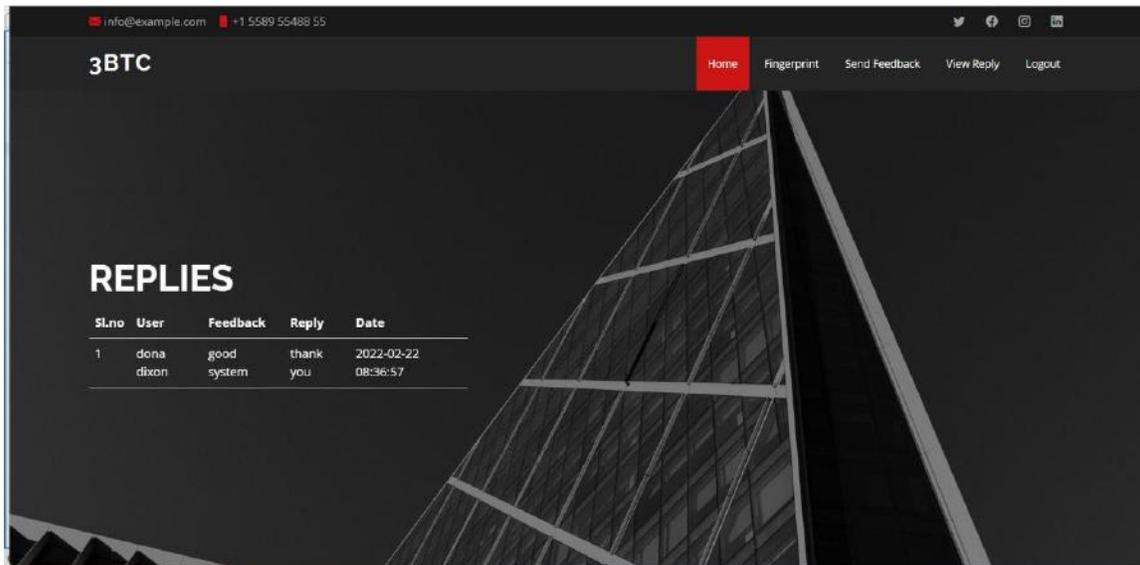
*Fig 8.5 Fingerprint Upload page*

By clicking on the Send Feedback option the user can send feed backs to the admin. The Fig 8.6 shows the feedback form. The feedback is send to admin by clicking the Send button.

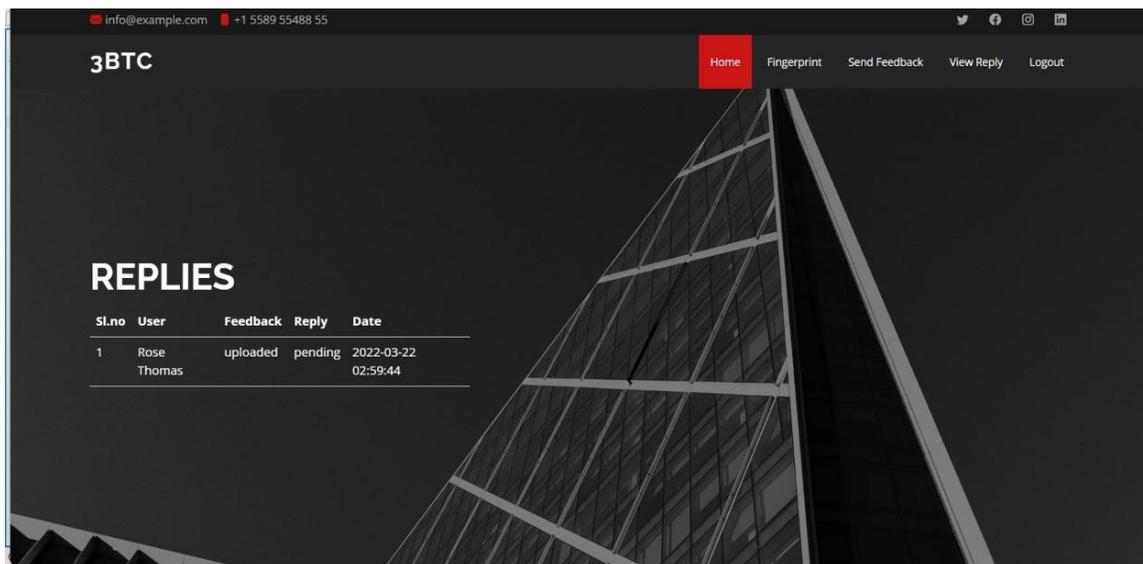


*Fig 8.6 Send Feedback page*

The user can view replies for this feedback from admin by clicking View Reply option on the top right corner. The replies of the Feedback can be viewed in a table format along with the date and time when replied, if not replied the user can find his feedback pending in the reply column as shown in **Fig 8.8**



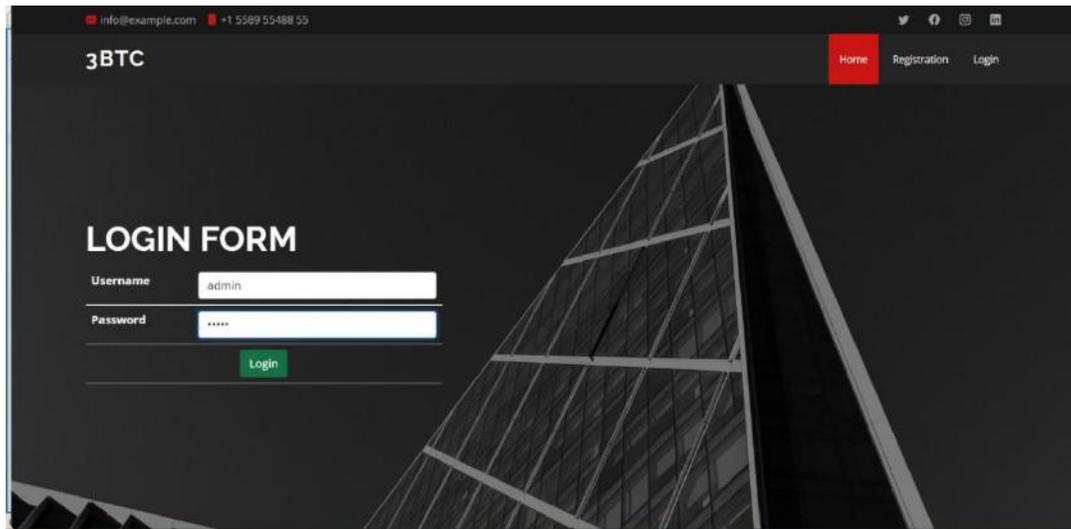
**Fig 8.7** View Reply page



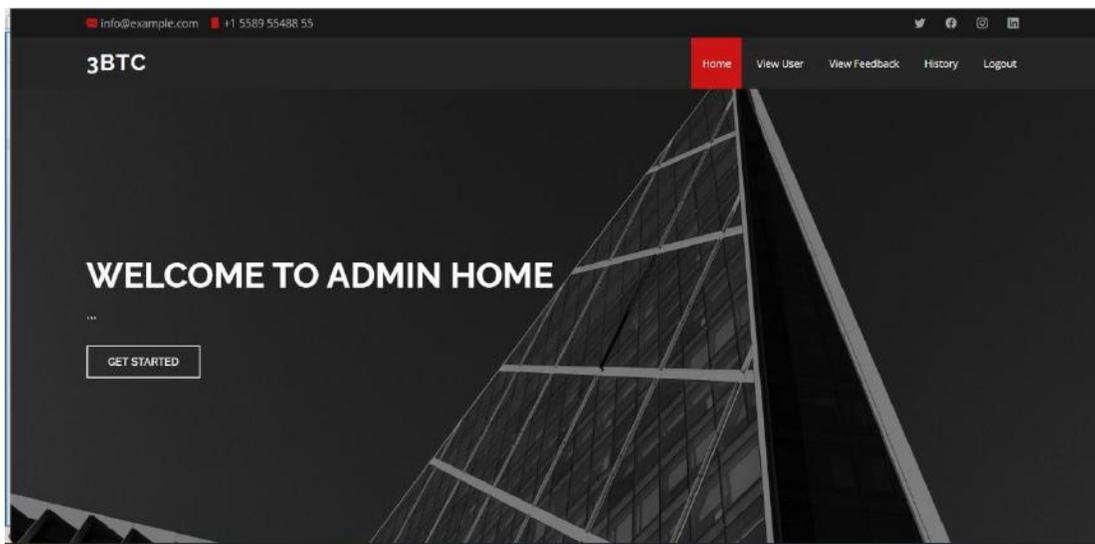
**Fig 8.8** View Pending Reply

To Logout click on Logout option at the top right corner, the user is taken to the Home page as shown in **Fig 8.1**.

To login as admin go to Login Page and enter the username and password of admin. The admin is taken to Admin Home page as shown in **Fig 8.10**

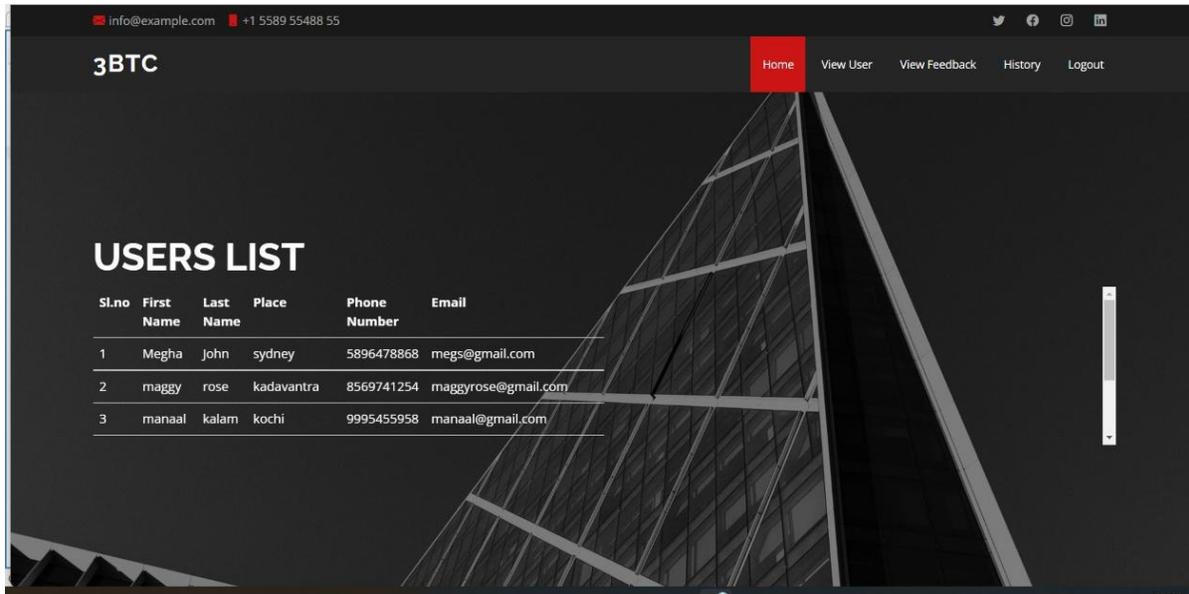


**Fig 8.9 Admin Login**



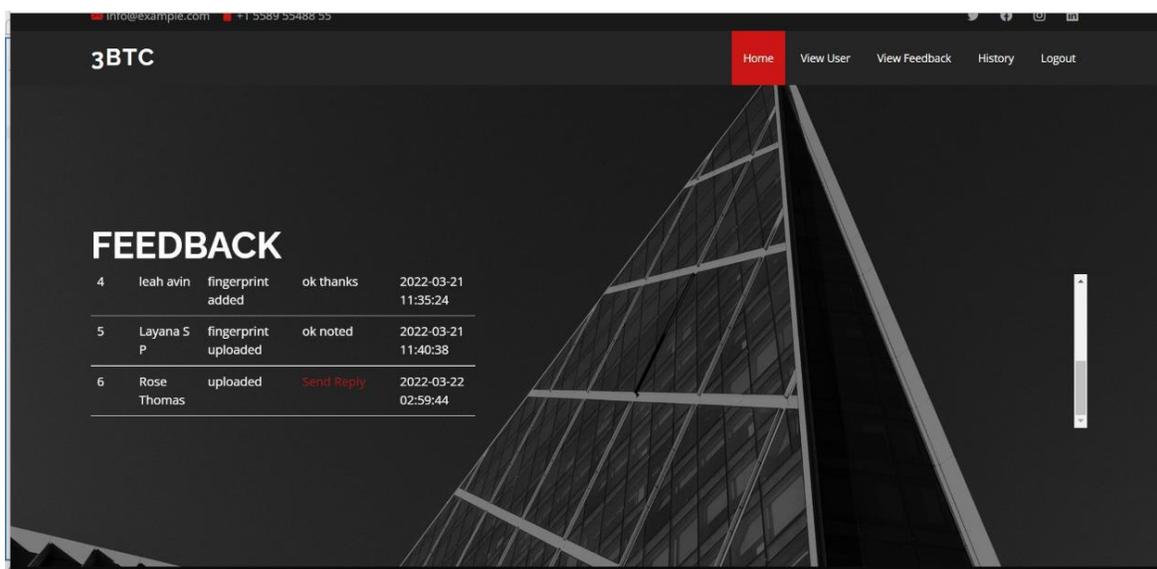
**Fig 8.10 Admin Home Page**

Admin can view the list of users who have registered through the portal along with their information as shown in the figure below in table format.



*Fig 8.11 View Users Page*

By clicking on the View Feedback option, admin can view feedbacks send by the users as shown in *Fig 8.12* and also reply to the pending feedbacks by clicking on Send Reply Button in the Reply Column which will take admin to Send Reply Page as shown in *Fig 8.13* where the admin relies to the feedback. By clicking the Send button ,the reply is sent and admin is taken back to View Feedback Page with the updated data as shown in *Fig 8.14* .



*Fig 8.12 View Feedback Page*

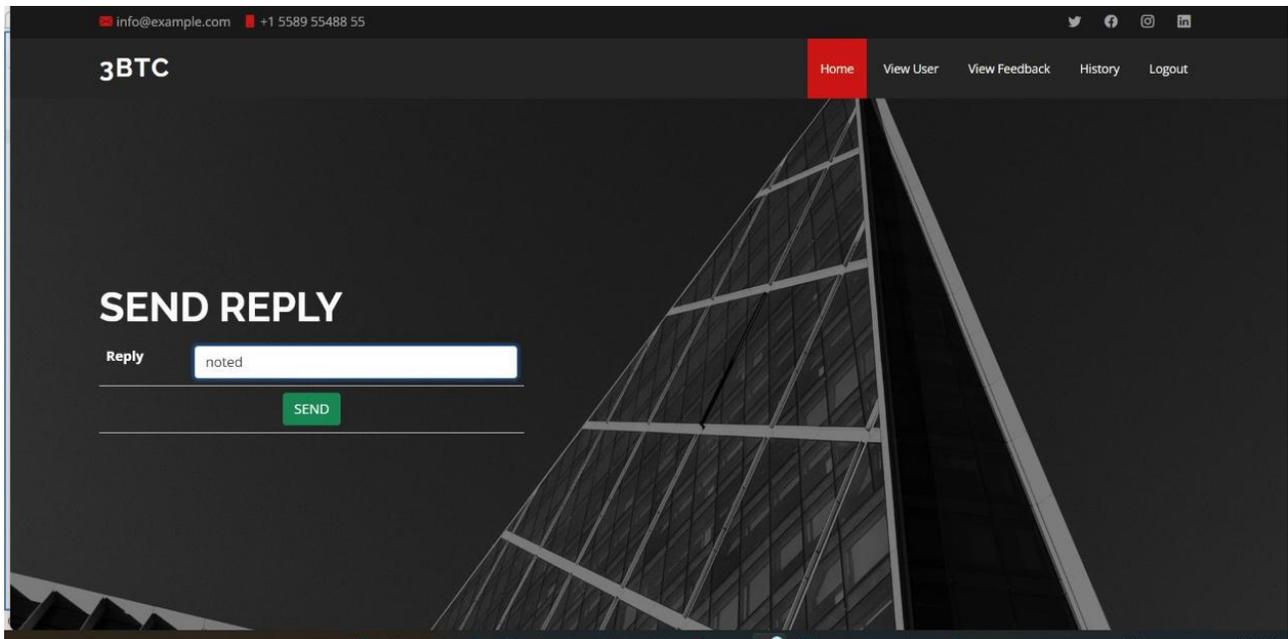


Fig 8.13 Send Reply Page

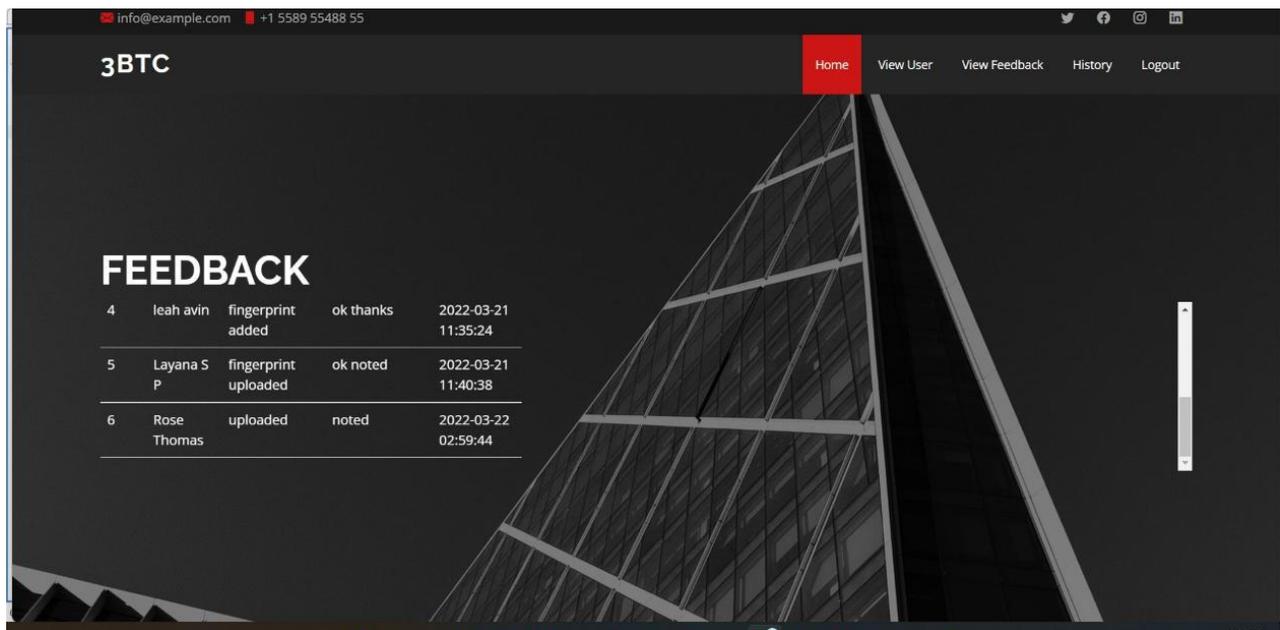
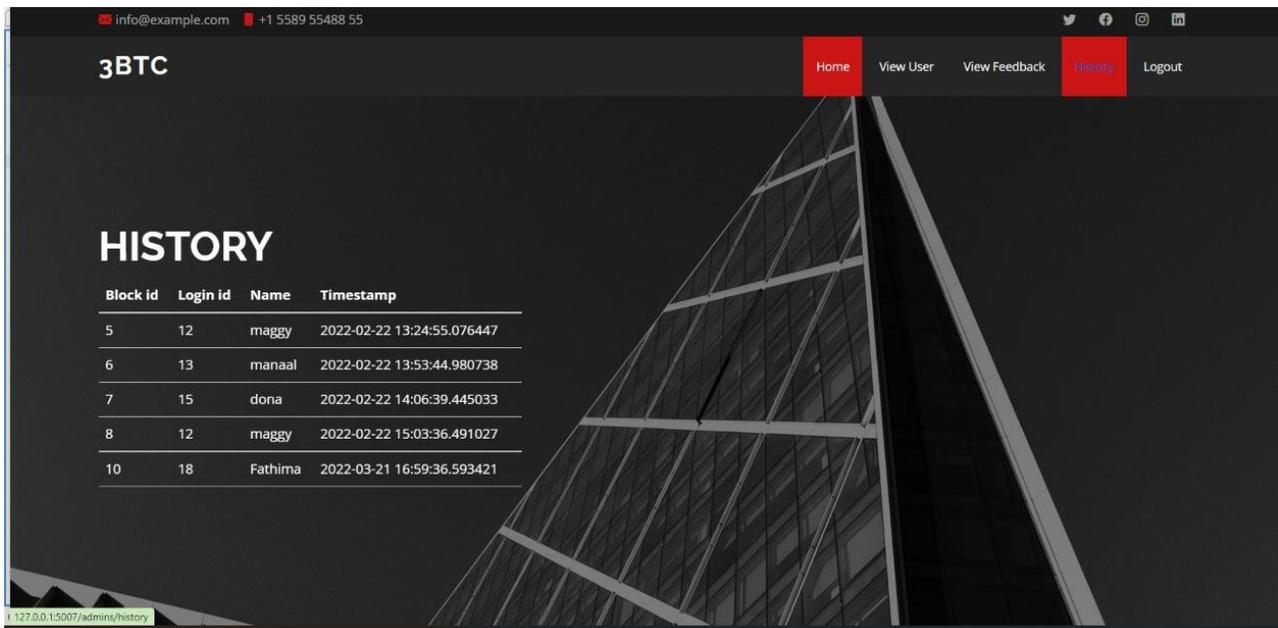


Fig 8.14 Updated Feedback Page

By clicking on History option the admin is able to view the list of users who had secured their fingerprint in blockchain with the Block Id which specifies the Block Number in which the fingerprint is stored, the Login Id of the user, Name of the user along with Time and date of uploading the fingerprint.



*Fig 8.15 History Page*

The Logout option on the top right corner logs out the session and takes the admin to the Home page as shown in *Fig 8.1*.

## CHAPTER 9

# CONCLUSION

As we know, Biometric authentication is a security process that relies on the unique biological characteristics of individuals to verify them as who they say they are. Biometric authentication has become increasingly popular in recent years. With the development of cloud computing, database owners are motivated to outsource the large size of biometric data and identification tasks to the cloud to get rid of the expensive storage and computation costs, which, however brings potential threats to users' privacy. It is of utmost importance to ensure the security of confidential biometric data in the cloud storage along with making sure that only properly authenticated user and authorized user can access the data in the cloud.

This project has taken that into account and has used blockchain to secure and store the biometric data in the system. Implementation of Biometric authentication mechanism with the use of blockchain will take security of data and access control in cloud to higher levels.

Cloud based biometric services have an enormous potential market value and as such attract research and development groups from all around the world, ranging from non-profit organizations to government websites or applications, biometric acquisition plays an important role, whether it is storing, securing, accessing or just to enter a building without any issues with security or data leakage.

In the future, the project aims to improve the biometric data acquisition technique. It will improve the user identification process using Generic Biometric Recognition System vastly.

Generic Biometric Data Acquisition Biometric System automatically identifies the unique feature of an individual for better evaluation and verification in recognition systems. Thus, leading us one step closer towards a threat free and secure cloud computing network.

## CHAPTER 9

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# CHAPTER 10

## APPENDIX

### Source Code

```

from flask import *
import uuid
import smtplib
import hashlib
from database import *
import datetime
import codecs
import base64
import Crypto
from Crypto.Cipher import AES
from Crypto import Random

BLOCK_SIZE = 16
pad = lambda s: s + (BLOCK_SIZE - len(s) % BLOCK_SIZE) * chr(BLOCK_SIZE - len(s) %
BLOCK_SIZE)
unpad = lambda s: s[:-ord(s[len(s) - 1:])]

def get_hashed_value(previous_hash, data):
    header_bin = (str(previous_hash) + "" + str(data))
    inner_hash = hashlib.sha256(header_bin.encode()).hexdigest().encode()
    outer_hash = hashlib.sha256(inner_hash).hexdigest()
    return outer_hash

def create_block(lid, updates):

    #adding the checking proces to blockchain
    q = "SELECT * FROM block_chain ORDER BY block_id DESC LIMIT 1"
    print(q)
    res = select(q)
    new_hash = 0
    previous_hash = 0
    time_stamp = datetime.datetime.now()

    if res:
        previous_hash = res[0]['block_hash']

    new_hash = get_hashed_value(previous_hash, time_stamp)
    password = "9874RRMFM"
    data = encrypt(str(updates), password).decode('utf-8')

    q='INSERT into block_chain values(null, "%s", "%s", "%s", "%s", "%s")'%(new_hash, data,

```

```
previous_hash, lid, time_stamp)
    insert(q)

    return "success"

def temp_function():
    data = "sreejesh"
    password = "9874RRMFM"
    enc = encrypt(data, password)
    print(enc)
    enc = enc.decode('utf-8')
    print(enc)
    # dec = decrypt("b'gCYoUQBNO4zm8I5euNr9hQtJe/t0ck3Vh3mb1nXJ4DU=", password)
    # print(dec)

def encrypt(data, password):
    private_key = hashlib.sha256(password.encode("utf-8")).digest()
    raw = pad(data)
    iv = Random.new().read(AES.block_size)
    cipher = AES.new(private_key, AES.MODE_CBC, iv)
    return base64.b64encode(iv + cipher.encrypt(raw))

def decrypt(enc, password):
    private_key = hashlib.sha256(password.encode("utf-8")).digest()
    enc = base64.b64decode(enc)
    iv = enc[:16]
    cipher = AES.new(private_key, AES.MODE_CBC, iv)
    return unpad(cipher.decrypt(enc[16:]))
```

**“REVIEW ON POISONOUS EFFECTS OF  
COMMON GARDEN PLANTS”**

**DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE  
REQUIREMENTS OF BACHELOR OF SCIENCE IN BOTANY**

**BY  
LEMIHA P.H  
REG.NO: AB19BOT038**



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2019-2022**

## CERTIFICATE

This is to certify that the dissertation entitled '**REVIEW ON POISONOUS EFFECTS OF COMMON GARDEN PLANTS**' submitted in partial fulfilment of the requirements for the degree of Bachelor of Science in Botany is an authentic record of the work carried out by **LEMIHA P.H** during her B.Sc. course from 2019-2022 under the guidance and supervision of **Dr. ELSAM JOSEPH**, Department of Botany, St. Teresa's College (Autonomous), Ernakulam.

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## DECLARATION

I LEMIHA P.H declare that the dissertation entitled is an authentic research work carried out by me under the supervision and guidance of Dr. Elsam Joseph, Assistant Professor, Department of Botany, St. Teresa's College (Autonomous), Ernakulam, in partial fulfilment of requirements for the award of B.Sc. Degree in Botany and no part of it has previously formed the basis for the award of any degree, diploma or associate ship in any institution.

Place :

LEMIHA P.H

Date :

AB19BOT038

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LEMIHA P.H



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## INTRODUCTION

Plant toxins are naturally occurring phytochemicals or secondary metabolites formed by plants to protect themselves against various threats like bacteria, fungi, insects, and predators. Plant toxins are generally the metabolites produced through plants to protect themselves against different threats like insects, predators and microorganisms. The toxins found in food plants are due to natural or new reproduction methods which enhance defensive mechanism. The plant part which may cause toxic effects includes roots, tuber, stem, fruits, buds and foliage. Natural toxins are present in numerous types of plants and these are ingested as food and when consumed in large quantity and without cooking properly leads to food poisoning. These toxic substances when ingested can be potentially harmful to human health. Some plants produce phytotoxins that can severely harm or destroy any herbivore. This phytotoxins also have a role in defense against pathogens and insects. Phytotoxins such as ricin and rRNA N-glycosidase have the potential to be used as bio-threat agents. They can be modified to exemplify improved affinity and efficacy for health endorsement. Several of these plants are commonly consumed as food. They have been developed as an evolutionary movement for self-protection. These toxic substances when taken in considerable amount can be harmful to human health and cause discomfort.

Natural plant toxins may be present naturally in plants such as fruits and vegetables that are common food sources. They are usually secondary metabolites produced by plants to protect themselves against various threats such as bacteria, fungi, insects and predators. Natural toxins may also be present in food plants because of natural selection and new breeding methods that enhance these protective mechanisms. Plants are usual cause of medical dilemma, generally due to the phytochemicals. The different flowering plant species differ not only in profile but also in limitless biochemical properties. Phytochemical substances are not only to compensate animal pollinators and seed distributors, but also to protect them from animals, which pose a risk. However, some phytochemical or secondary metabolites produced by the plant are toxin like substances, which are alike extracellular bacterial toxins in their properties and may cause problems in humans. These have both useful and harmful effects in human beings and animals. The effects are varying widely from skin irritation to thyroid problems and neurological syndromes.

Plant toxins may enter the body either by inhalation, swallowing or by contact. The action is mainly dependent on their Phyto -constituents like alkaloids, glycosides, proteins, tannins, volatile oils, terpenes, steroids. They act in the animal or human body by varying specific mechanisms involving receptors, transporters, enzymes and even genetic material at specific cells and tissues. In some plants, the poisonous constituents occur throughout the whole plant. In others, they are present in one or more parts. The doses of these substances are the most important factor. Our surroundings are natural habitats of several poisonous plants. The study of phytotoxins is known as "Phyto-toxicology". Some poisonous plants also accumulate

inorganic compounds from the soil. These phyto constituents will result local toxicity in the cardiac, neurotic, muscular, vascular tissues. Plant forms and growing conditions also affect the degree of plant toxicity (Chippendale and Murray,1963)

Many native and exotic plants are poisonous to humans and herbivorous when ingested or if there is skin contact with plant chemicals. These plants can be found in the garden as naturally grown or as planted. Poisoning can be by contact causing skin irritation, ingestion causing internal poisoning, absorption (by the skin) and inhalation (in the respiratory system). Some plants which are considered as harmless are actually not so. Children in particular appear highly victimized by accidentally eating poisonous plants. Fatalities due to consumption of toxic plants are seen in bits and pieces, but an accurate pattern of such cases is hardly reported particularly from country like India. An epidemiological study based on the data from 2000 to 2011 in Italian Poison Control Centre (PCC) was related to livestock's poisoning due to exposure of plants. Recorded data revealed that 5.7 % of the total exploration is due to toxic foliage including *Euphorbia pulcherrima*, *Cycas revoluta*, *Hydrangea macrophylla*, and *Nerium oleander*, etc (Caloni et al., 2013).

This review gives an idea of plants established on their chemical constituents known as chemotaxonomy. The substances accountable for toxic conditions or toxic reactions derive from many different pathways inside the plants. Notwithstanding, most poisonous principles are painstaking as secondary metabolites or by-products from the indispensable functions of the plant. Stage of toxicity and many references classify plants as extremely, moderately, or minimally toxic. According to the origin of plant toxins, they are classified as: Natural toxins (produced by different types of fungi, microorganisms, flora, and fauna), Synthetic poisons (Poisons produced by humans and includes pesticides, sedative drugs, alcohols, chemicals, Household poisons). Another categorization of toxic plants is based on the presence of toxic constituents and their chemical nature, phylogenetic relationship, or botanical qualities. Based on the toxic effects, classification of poisonous plants is as follows: Plants that are poisonous to eat, Plants that are poisonous on interaction or contact, Plants that produce photosensitization, and Plants that produce airborne allergies.

Literature reports that amount of poisonous substances, exposure-dose relation, biological and chemical properties (uptake of heavy metals and bioavailability of metal in the soils) and the effects of toxicity depend upon the age and differences on the genetic level of the plant, climate, soil influence, geographical location, condition, dose, nature of plant parts (root, bulb, stem, leaf, seed, or sap). Different species of the plant, their age, size, nutrition, dietary components, and health condition of the victim also affect toxicity (Botha and Penrith, 2008; Sekhar et al., 2012). Furthermore, many plants are merely poisonous or causing symptoms only in an unusual circumstance, when they are consumed in large quantity (Berdai et al.,2008).

This review article has the basic details on six different plants which are commonly planted as a part of indoor and outdoor gardens in India. The selected plants are- *Digitalis purpurea*, *Nerium oleander*, *Caladium*, *Dracaena trifasciata*, *Gloriosa superba*, *Alocasia sanderiana*. The goal of this review is to offer better understanding on the habitat, basic morphological

and anatomical features of these plants, their poisonous contents and their various effects on humans and animals, and medicinal properties.

## REVIEW OF LITERATURE

India being one of the prevalent producers of herb and herbal products, is known as the “botanical garden of the world” (Nayar and Sastry, 1999). Published data projected that there are about 4,00,000 vascular plant species on the earth exist, and produced hundreds to thousands of metabolites whose composition, function, and other utility have been merely investigated (Wang et al., 2019). Literature reported that most of the phyto-constituents have important therapeutic activities like insecticidal, antibacterial, spasmolytic, antioxidant activities, anti-plasmodial, antifungal, and anticonstipative (Khan and Akhtar, 2012, Gurjar et al., 2012; htamoGi et al., 2015; Sofowora, et al., 2013).

Literature has reported the plant products are generally safer than chemical ones. A little amount of dose may prove beneficial and high dose with prolonged time becomes harmful (Mensah et al., 2019). All of these phytochemicals are made throughout species-specific with particular biochemical pathways that modify the primary metabolites.

Plants produce metabolic products which contain various poisonous metabolites. When these are injected or introduced in the body of living organisms even in small dose, they can cause serious impairment of the bodily functions leading to death (Chopea et al., 1949).

Phytotoxicity is a main apprehension in phyto-medicine and other situations where potentially toxic plants are consumed. Besides the medicinal properties of plants, they produce harmful by products such as tannins, glycoside, toxa-albumin, and alkaloids; etc that can cause adversarial toxic effects in lives (Yuan et al., 2016). Poisonous plants in all around the world are the third largest class of poisons (Bhatia et al., 2014). A research report disclosed medicinal use of toxic plant like seed paste of *Abrus precatorius* (for joints pain relieve); *Argemone mexicana* seed oil mixed with oil of *Ricinus communis* (for treating skin irritation and wounds) (Bhatia et al., 2013; Upadhyay et al., 2007; Devi, 2017). When a plant in small amount of its leaves, seeds, stem, fruits, and roots is injected, ingested, inhaled and contacted directly, may cause a harsh problem or even death is known as poisonous one (Khajja et al., 2011).

Literature reported there are approximately 700 poisonous plant species from India (Chopea, 1949). Plant poisoning in children relatively differs from an adult. Since children are very curious, they will often chew on anything reachable easily, including attractive berries or fruit. Plants are capable of differing by degree of toxicity and many references classify plants as extreme, moderate, or minimum toxic. Thus, some cases are not generally fatal due to the low toxicity of plants or else only vomiting takes place while other several cases are becoming serious when not attended by medical specialists (Yipel et al., 2014).

Commonly accepted classification of poisonous substance is enumerated (Chopra et al., 1965) according to botanical system, chemical constituent's (alkaloids, glycosides, and protein, etc); and physiological action (CNS nerve poison, cardiac poison, and muscle poison,

etc). Besides being non-motile and having devoid of immunity, the plants are not helpless against biotic and abiotic stress (Ahmed et al., 2017). Plant release a wide variety of chemicals approximately more than 100 phytochemicals belonging to various classes includes: alkaloids, glycosides, terpenoids (steroids, saponins), tannins, amino acids ( $\gamma$ -amino butyric acid (GABA), phenolics (flavonoids, tannins), cyanogenic glucosides or other peptides/proteins (lectins, sporamin, proteinase inhibitors), latex and inorganic compounds (oxalate, SiO<sub>2</sub>, selenium) metabolites. They specifically transform to corresponding target molecule in human and animals (Mujeeb et al., 2014).

Classification of plants established on their chemical constituents known as chemotaxonomy. The substances accountable for toxic conditions or toxic reactions derive from many different pathways inside the plants. Notwithstanding, most poisonous principles are painstaking as secondary metabolites or by-products from the indispensable functions of the plant. Stage of toxicity and many references classify plants as extreme, moderate, or minimally toxic are differ within plants. Classification of active principles of poisonous plants is based on the chemistry of their toxicity, and its effect on the victim. Plants have a number of chemical compounds (active primary and secondary metabolites or phytochemicals) to tackle with supersede competitors, pathogens, and several environmental constraints. Primary metabolites are present in all tissues of plants and include carbohydrates, lipids, carbohydrate, protein, and amino acids. They help in cell growth and cell division, storage, respiration, reproduction and perform metabolic activities such as photosynthesis, and glycolysis, etc. Majority of these compounds do not openly participate in the development, growth, and reproduction of plants (Bottger et al., 2018; Hussein and Anssary, 2018). Any parts of the plant (seed, root, leaf, etc) when applied externally or administered, ingested, inhalation even a small amount can produce allergic reaction (by spores and pollen), skin rashes or dermatitis (by irritant compounds), skin photosensitization, irritation, etc. (Pagare et al., 2015; Bhatia et al., 2014). Plant can produce severe poisoning e.g. blood poisoning (*Prunus* spp), cardiac poisoning (Foxglove, *Digitalis purpurea*) and nerve poisoning (Strychnine nux vomica and toxic mushrooms) (Douglas, 2008). Toxic constituents are bioactive compounds that degrade neuroreceptors disrupting ion channels (Wink, 2015). The modes of action takes place by non-specific acting (toxicants resulting in narcosis), and specific acting (non-narcotic and a specific action produce at a specific target site). Nonspecific mode alters the cell membranes whereas in specific MoA some biological process are modified or hampered due to binding of bioactive compounds at a specific site. These bindings might also be reversible (Gupta, 2018). Different specific MoA involves uncoupling of oxidative phosphorylation, acetylcholinesterase (AChE) inhibition, irritants, central nervous system (CNS) seizure, respiratory blockers (Pope et al., 2005; Sharma et al., 2009)

Literature reports that amount of poisonous substances, exposure-dose relation, biological, chemical (uptake of heavy metals and bioavailability of metal in the soils) and the effects of toxicity depend upon the age and differences on the genetic level of the plant, climate and soil influence, geographical location, condition, dose, nature of plant parts (root, bulb, stem, leaf, seed, or sap), For example, immature shoots of pokeweed or pokeberry (*Phytolacca americana*) are not evenly poisonous but their roots and fruit are poisonous. Different species

of the plant, age, size, nutrition and dietary components, health condition of the victim also affect toxicity (Botha and Penrith, 2008; Sekhar et al., 2012). Furthermore, many plants are merely poisonous or causing symptoms only in an unusual circumstance, when they are consumed in large quantity (Berdai et al., 2012).

Toxic agent is a poisonous substance or a poison whereas a term toxin refers to ‘poison’ produced from the biological sources e.g. venom, plant toxin, and so forth. Toxicology is the fundamental science of poison involves absorption, distribution, metabolism and excretion (ADME). According to Paracelsus “Everything is poison, there is poison in everything, only the dose causes a thing not a poison” (Khajja et al., 2011; Tamilselvan et al., 2014). Dose is the central factor of toxicity, the amount of compound consume per unit of body weight and concentration (ppm or ppb). Here, large number of substances exists (drugs, plant products, and chemicals (metals and non-metals) which can cause toxicity or poisoning in both humans and livestock’s. Diagnosis of any poisoning cases based on the medical history, signs, laboratory examinations and analytical procedures (Singh et al., 2011). In biological point of view, the main key factor of toxicity is the measure of poison and another is dose. In the early 18th century, Hermann Boer a Dutch physician discussed the theory of poison when hot conditions yield the characteristics odours. He was not yet successful his theory, but he proposed chemical methods for the identification of poisons. In the middle ages, the most common plant poisons were Aconite, Hemlock, and *Atropa belladonna* and other toxic inorganic substances like mercury salts, and arsenic.

In 1814, Mathieu Orfila “Father of Forensic Toxicology” published first systemic advancement in the study of physiological, and the chemical nature of poisons (Eckert, 1996) After that 1850, a Belgium scientist, Jean Servials Stas successfully isolated an alkaloid of nicotine with help of ethanol from the human body organs/tissues (Poklis,1997). After that, Stas method has become some modifications, by the Friedrich Otto (German chemist) that Stas-Otto method was used to isolation of various poisonous alkaloids including morphine (Steenkamp, 2005). Forensic toxicologist usually deals with cases of plant poisoning where a trace amount is available in the biological samples. The analytical strategies face challenge in such cases while screening and identifying of such plant constituents.

Incidences of human and livestock poisoning in India are huge, and annually estimate more than 50,000 incidences from toxic exposure (Khajja et al., 2011). According to Poison Control Centers (PCC), the exposure of plant is one of the most frequently used poisoning (Bruni et al., 2010). Dealing with plants without having proper knowledge can lead to severe injuries (and even death) in farmers and laymen, and a similar type of lack of knowledge amongst doctors of a region about potential toxic plants of surroundings can hinder the proper management of such accidental/suicidal toxicities. In general, the identification of toxic plants could be hard to distinguish from other plants because of their similarly and sometimes do not show distinct differences (Chandra and Sharma, 2014).

Many edible plants have deadly relative’s species, which look alike. A lack of sound knowledge about poisonous plants can lead to a serious scrutiny of a medico legal case. The current trend also describes use of Botanical Weapons based on ingredients of poisonous

plants (Khajja et al., 2011). For imparting better understanding, knowledge and research aptitude about plant poisons in community, there is urgent demand to enhance this field and conduct some field survey in the native area.

## **OBJECTIVES OF THE STUDY**

Scientists believe that toxins provide a defence against plant-eating animals. Many of these poisons are quite distasteful. Even though many plants that produce particular poisonous chemicals can harm humans and other animals. Some of these poisons cause injury or death if swallowed or inhaled.

Most of the major plant poisons are produced by flowering plants. On the study of poisonous contents present in plants of both indoor and outdoor, our main objective is to formulate and generalise particular poisoning plants, poisoning contents their physiological effect on animals and humans in connection with the symptoms and preventions. A number of poisonous species are popular especially in garden plants, indoor and outdoor. Some poisons directly affect the nervous system. Poisons that interfere with the transmission of impulses from the nerves to the muscles are called neuromuscular poisons which we study from foxglove, a common garden plant.

The main objective of this review is to identify toxic plants and their toxic compounds, and to determine how the plants poison humans and animals, and develop diagnostic and prognostic procedures.

# CHAPTER 1

## *Nerium oleander*



Kingdom:     Plantae  
Clade:        Tracheophytes  
Clade:        Angiosperms  
Clade:        Eudicots  
Clade:        Asterids  
Order:        Gentianales  
Family:       Apocynaceae  
Subfamily:   Apocynoideae  
Genus:        Nerium  
Species:      *Nerium oleander*

Oleander plants (*Nerium oleander*) are among the most versatile of shrubs.

All parts of oleander shrubs are poisonous and the smoke from burning oleander debris is also toxic. Ingesting even a small amount of foliage, flowers, or shoots from an oleander plant can be fatal. Contact with the foliage and flowers can cause severe skin irritations and allergic reactions as well. This plant is extremely toxic, and a single leaf may kill an adult.

## **POISONOUS CONTENTS**

Oleandrin and neriine are two very potent cardiac glycosides (cardenolides) found in all parts of the plant. Red flowered varieties of oleander appear to be more toxic. Oleander remains toxic even when dry. A single leaf can be lethal to a child eating it, although mortality is generally very low in humans. This results in progressive decrease in electrical conductivity through the heart causing irregular heart activity, and eventual complete block of cardiac activity, and death. Oleander should not be planted in or around livestock enclosures. Livestock are usually poisoned when they are allowed to graze in places where oleander is abundant or when prunings are carelessly thrown into animal pens. Poisoning as a result of eating an oleander plant can cause severe digestive problems, seizures, comas and even death. Additionally, those that touch the leaves on an oleander plant may experience skin irritation. When bruised, burned or damaged, the leaves of poison ivy plants release an oil that is responsible for causing a reaction. Touching may cause a rash, bumps, blisters, swelling and itching within a few days, although it is not contagious between humans. And it will not spread by scratching. If the oil sticks to clothes, pets or other nearby items, you may experience symptoms if you touch those items too.

## **SYMPTOMS**

Major symptoms of oleander poisoning are cardiac and gastrointestinal in nature and appear 2-4 hours after ingestion. These include oleandrin, oleandroside, nerioside, digitoxigenin, thevetin and thevetoxin. The oleander seeds are highly irritant to gastrointestinal tract and the symptoms range from nausea and vomiting to cramping and bloody diarrhea. Oleander also causes irritation to the mucosal membranes, resulting in burning around the mouth and increased salivation. Confusion, dizziness, drowsiness, weakness, visual disturbances and mydriasis are the central nervous system manifestations of toxicity. The calculated lethal oleander leaf dose was found to be approximately 4gm in previous studies. Some of the cardiac glycosides and hydro-methalonic extracts of oleander are also known for their pharmacologic properties, as this plant is extensively used for treatment of diverse ailments in complimentary and alternative medicine also.

## **PRECAUTIONS**

There are some precautions to be taken while dealing with this plant such as: - Washing your hands with warm soapy water after touching the plant will remove the toxins, even if your skin is not prone to irritation caused by nerium oleander. The toxins that are present in the plant can easily be transferred to your eyes or mouth. So make careful about it. If someone eats or chew oleander by mistake from the plant, they should immediately seek medical aid in case of any irritation occur. Ingesting can sometimes cause fatal. It is better to keep away from children. Always remember to wear gloves while handling it, is the another better precaution to avoid skin irritations.

## CHAPTER 2

### *Caladium bicolor*



Kingdom: Plantae

Clade: Tracheophytes

Clade: Angiosperms

Clade: Monocots

Order: Alismatales

Family: Araceae

Subfamily: Aroideae

Tribe: Caladieae

Genus: *Caladium bicolor*

Caladium is a genus of flowering plants in the family Araceae. They are often known by the common name elephant ear (*Alocasia*, *Colocasia*, and *Xanthosoma*), heart of Jesus and angel wings. Caladium are important ornamental aroids, they are valued for their colorful and variably shaped leaf. They are usually grown as pot or hanging basket plants or planted in landscape as accent or border plants. Several members of the genus, especially *Caladium bicolor*, are widely cultivated for their showy, fragile-looking, variably coloured leaves. The leaves are typically heart- or arrowhead-shaped. Caladiums are nonhardy ornamentals, used as potted plants indoors and in summer outdoor plantings. The leaves generally have prominently colored midribs, contrasting margins, and patterns including mottled, veined and striped, in various combinations and shades of green, white, pink, rose and/or red. There are no stems; the leaves are borne on long petioles which arise directly from the underground tuber. The two main types of caladiums are the fancy- leaved types, which have large, heart-shaped or semi-heart-shaped leaves on long petioles (12 to 30 inches tall), while the strap- or lance-leaved types, with their shorter and narrower, ruffle-edged leaves on short petioles, are more compact (usually less than 12 inches tall). The lance-leaved types (derived from *C.picturatum*) have more leaves per tuber than fancy-leaved types. Although they are grown as foliage plants, caladiums may bloom, producing a single (rarely 2-3) typical arum-type flower with a green or pinkish spathe surrounding a short white spadix. Fruits are white berries with several to many seeds. Most people remove the inflorescence since it takes away energy from the plant that otherwise would be used to produce more leaves or a bigger tuber. Use caladiums to add color and texture in shade gardens and in containers for decks and patios. As a houseplant, provide a warm location with bright but indirect light, and lots of humidity. Even indoors, caladiums will enter dormancy after a few months in leaf. When their leaves start to die back, stop watering. Allow the plant to rest and resume watering once new growth starts.

## **POISONOUS CONTENTS**

All parts of the plants contain calcium oxalate crystals and are considered poisonous. The main poisonous ingredients are Calcium oxalate crystal, Asparagine, a protein found in the plant. All parts of the plants are poisonous if large amounts are eaten. Caladium and related plants are used as houseplants and in gardens.

## **SYMPTOMS**

Symptoms from eating parts of the plant or from the plant touching the eye include Burning in the mouth or throat, Damage to the outer clear layer (cornea) of the eye, Diarrhoea, Eye pain, Hoarse voice and difficulty speaking, Increased salivation, Nausea or vomiting, Swelling and blistering in the mouth or tongue, Blistering and swelling in the mouth may be severe enough to prevent normal speaking and swallowing.

This plant contains insoluble calcium oxalate crystals similar to other plants in the Araceae family. Chewing or biting into this plant will release these crystals causing tissue penetration and irritation the mouth and oral cavity. Very rarely, swelling of the upper airway occurs making it difficult to breathe. Common signs are Drooling, Pawing at the mouth or face and Oral pain.

## **PRECAUTIONS**

If the plant was eaten, wipe out the mouth with a cold, wet cloth, and give the person milk to drink. Call poison control for more treatment information. If the eyes or skin touched the plant, rinse them well with water.

## CHAPTER 3

### *Dracaena trifasciata*



Kingdom: Plantae  
Order: Asparagales  
Family: Asparagaceae  
Subfamily: Nolinoideae  
Genus: Dracaena  
Species: *Dracaena trifasciata*

*Dracaena trifasciata* is a species of flowering plant in the family Asparagaceae, native to tropical West Africa from Nigeria east to the Congo. It is most commonly known as the snake plant, Saint George's sword, mother-in-law's tongue, and viper, bowstring hem.

It is an evergreen perennial plant forming dense stands, spreading by way of its creeping rhizome, which is sometimes above ground, sometimes underground. Its stiff leaves grow vertically from a basal rosette. Mature leaves are dark green with light gray-green cross-banding and usually range from 70–90 centimetres (2.3–3.0 ft) long and 5–6

centimetres (2.0–2.4 in) wide, though it can reach heights above 2 m (6 ft) in optimal conditions.

*Dracaena* species generally thrive with little light, making them ideal for relatively dim interiors. The plants are also adaptable to many spaces; they can reach anywhere from 2 to 10 feet high, and are just about 2 feet wide. Many species have water-resistant leaf fibres that are sometimes used in the manufacture of ropes and for bowstrings, and several are grown as ornamentals for their attractive foliage. It is sometimes sold as *Sansevieria*. Plants of the *Dracaena* genus generally are easy to grow and, at least indoors, the diseases to which they are susceptible are rarely an issue. Though the plants are tolerant of low light conditions, they do even better in direct sunlight. Avoid planting *Dracaena* in soil with high levels of fluoride or irrigating it with heavily fluoridated water, as it is sensitive to fluoride. Also avoid fertilizers with superphosphates, which typically contain high fluorine levels. A slightly humid environment also benefits *dracaena* growth; if you must plant them in drier conditions, occasionally mist the foliage with water. The plant exchanges oxygen and carbon dioxide using the crassulacean acid metabolism process, which allows them to withstand drought.

## **USES**

A fibre obtained from the leaves is used to make string, mats etc. The leaf pulp is used for cosmetics. The NASA Clean Air Study found *S. trifasciata* has air purification qualities, removing 4 of the 5 main toxins. Widely used as an ornamental, in both the tropics outdoors in both pots and garden beds and as an indoor plant in temperate areas. It is popular as a houseplant because it is tolerant of low light levels and irregular watering; during winter it needs only one watering every couple of months. The plant is used to treat ringworm and fungal diseases. The leaf sap is applied directly on infected sores, cuts and grazes, it is also used to treat fungal and scabies infections.

## **POISONOUS CONTENTS**

The slight toxicity of the *Dracaena*'s leaves, you may prefer not to plant them if you have pets or small children. The plant contains saponins which are mildly toxic to dogs and cats and can lead to gastrointestinal upset if consumed.

If you have dogs or cats at home, it is advisable to avoid planting any *Dracaena*, which can be toxic if ingested, especially by smaller animals. The saponins in the plants leaves and bark can induce vomiting or vomiting blood, anorexia, excessive salivation and depression. Cats may also have dilated pupils. If your pet has ingested *Dracaena*, immediately contact your veterinarian.

In general, *Dracaena* are safe plants for humans to be around. Touching the plant's leaves and even accidental ingestion are unlikely to provoke any illness. However, regardless of toxin

content, many plants, including *Dracaena*, can cause negative reactions in people with allergies or heightened sensitivities. Therefore, never eat plants that are unfamiliar to you and teach children to do the same.

## **SAPONINS**

Saponins, the toxic compounds found in *Dracaena* plants, are a type of sugar derivative called glycoside with a characteristically foamy appearance. In fact, the compounds take their name from their presence in the soapwort plant, which was once used as soap. The bitter flavor of saponins discourages animals from eating the plants that contain them. In some cases, saponins are present in nontoxic quantities, even to animals, in foods such as oats and spinach. The saponins in these foods are even beneficial, improving calcium and silicon absorption and aiding digestion.

## **PRECAUTIONS**

After the plant material and sap have been ingested, children and animals will show some common symptoms, such as: Swelling on the lips, tongue, and mouth, Nausea, vomiting and diarrhoea, Abdominal pain, Loss of appetite. As it increases salivation, you may notice your pet drooling excessively. In the gastrointestinal tract, the foaming action of the poison results in cell death and the rupture of blood cells. Even though snake plants are safe to touch, they do contain toxins that are only harmful when consumed. However, the liquid from the leaves can cause skin irritation. The plant should always be handled with gloves whenever it is repotted. Because the Mother-in-law's tongue is an indoor plant it should be kept out of the reach of small children and pets, preferably on a high shelf. This will make it more difficult for your cat to climb the plant and ingest it. If you have a Mother-in-law's tongue plant in your home you should keep it in a room your cat cannot enter. If your pet has taken a bite from the plant, remove the bitten leaves from his mouth and consult with a veterinarian immediately. For pets or children who have ingested large amounts of poisonous plant material, treatment include flushing the mouth, inducing vomiting, or pumping the stomach to empty its contents, etc. may be followed.

## CHAPTER 4

### *Digitalis purpurea*



Kingdom:     Plantae  
Clade:        Tracheophytes  
Clade:        Angiosperms  
Clade:        Eudicots  
Clade:        Asterids  
Order:        Lamiales  
Family:       Plantaginaceae  
Genus:        Digitalis  
Species:      *Digitalis purpurea*

Foxglove, *Digitalis purpurea* is a common ornamental garden plant. Due to its toxic cardiac glycosides content it can result in severe poisoning to both humans and animals. Although the parts of the plant that grow above the ground can be used for medicine, foxglove is unsafe for self-medication. All parts of the plant are poisonous.

## **POISONOUS CONTENTS**

Poisoning may also occur from taking more than the recommended amounts of medicines made from foxglove. The major poisonous ingredients contain in fox glove are Deslanoside, Digitoxin, Digitalis glycosides. These poisonous substances are usually found in Flowers, leaves, stems, and seeds of the foxglove plant. Toxins can be transferred into the body through open wounds or if you rub your eyes after touching it. Apart from humans, foxglove cause poisoning effect to animals also. The whole of the foxglove plant is poisonous to dogs. Diarrhoea and vomiting are symptoms commonly seen. Foxglove poisoning most often occurs from sucking the flowers or eating the seeds, stems, or leaves of the foxglove plant.

Chemicals taken from foxglove are used to make a prescription drug called digoxin also.

## **SYMPTOMS**

Foxglove can cause irregular heart function and death. Signs of foxglove poisoning include stomach upset, small eye pupils, blurred vision, strong slow pulse, nausea, vomiting, dizziness, excessive urination, fatigue, muscle weakness and tremors, stupor, confusion, convulsions, abnormal heartbeats, and death. Long-term use of foxglove can lead to symptoms of toxicity, including visual halos, yellow-green vision, and stomach upset. Ingestion of any parts of the plant can result in severe poisoning

## **PRECAUTIONS**

There are some precautions to be taken while dealing with this plant such as: - Washing your hands with warm soapy water after touching the plant will remove the toxins. Even if your skin is not prone to irritation caused by foxgloves, the toxins that are present in the plant can easily be transferred to your eyes or mouth, so make careful about it. If someone eats foxgloves, or mistakenly brews a tea from the plant, they should immediately seek medical attention as even the smallest amount of foxglove ingested can be fatal. It is better to grow them out of the children as it cause even fatal. Always remember to wear gloves while handling it is the another better precaution to avoid skin irritations.

## CHAPTER 5

### *Gloriosa superba*



Kingdom:           Plantae  
Subkingdom:       Tracheobionta  
Division:           Spermatophyta  
Class:              Liliopsida  
Subclass:          Liliidae  
Order:              Liliales  
Family:             Liliaceae  
Genus:              Gloriosa  
Species:            *Gloriosa superba* Linn.

*Gloriosa superba* Linn. is a perennial climber, extensively scattered in the tropical and sub-tropical parts of India, up to an altitude of 6000 ft (Ghosh, 2002) including the foothills of Himalayas. In India it is widely distributed and is the state flower of Tamil Nadu. However, the species is enlisted as threatened in IUCN red data book.

*G. superba* is commonly known as 'Gloriosa lilly' and 'Kalihari'. The species is a vine with large leaf tendril to clutch the object, solitary or corymbose, bright colored flower(s) with perianth segments and wavy margins. The finger like tubers are V or L shaped, milky white in color when young and turns brown on ageing (Anonymous, 1989). The vine of *G. superba* is mostly available nearer to the water body in sandy to loamy, moist soil under the shade or surrounding a bush.

*Gloriosa superba* is used in traditional medicine in African and Asian countries and in India, and is farmed for its chemical compounds. It is used to treat a wide range of ailments and diseases in southern Africa, including intestinal worms, haemorrhoids, sprains, strains and bruises, impotence and infertility, as an antispasmodic, and for skin problems, tick infections, to kill lice, disinfect wounds and treat screw worm on cattle. The juice is used to treat snakebite and scorpion stings. Juice of the tuber is also used as a pain killer on a painful tooth. It has also been used as an arrow poison in parts of Africa. In India it is used mainly to treat gout and rheumatism. It is also been identified as a potential anti-cancer drug. This plant is commercially grown for use in Ayurveda medicine and as a cash crop for extracting colchicine in India and Africa.

It is a widely used and effective medicinal plant, It has been used in the treatment of gout, infertility, open wounds, snakebite, ulcers, arthritis, cholera, colic, kidney problems, typhus, itching, leprosy, bruises, sprains, haemorrhoids, cancer, impotence, nocturnal emission, smallpox, sexually transmitted diseases, and many types of internal parasites. But incorrect dosage has caused human deaths.

## **POISONOUS CONTENTS**

An important point which we should remember while planting *G. superba* is that all parts of this plant, both above and below ground, but particularly the tubers, are extremely poisonous, and ingestion could be fatal. The plants contain the highly active alkaloids such as colchicine, gloriosine, superbrine (a glycoside), chelidonic acid and salicylic acid. Ingestion of tubers results in severe poisoning in humans and animals. Mode of poisonous action is attributed mainly to colchicine and gloriosine for their anti-mitotic activity that arrests mitosis in metaphase. Cells with high turnover and high metabolic rate such as intestinal epithelium, hair follicle, bone marrow cells, etc. are highly susceptible to the toxic effects of GSb. Lethal dose is about 6 mg/Kg body weight and the fatal period following ingestion is about 12–72 hr. Acute manifestations of poisoning appear within 2–6 hrs of ingestion.

Mechanism of action Colchicine affects cell membrane structure indirectly by inhibiting the synthesis of membrane constituents. It binds to tubulin (the structural proteins of microtubules) preventing its polymerization into microtubules. This anti-mitotic property

disrupt the spindle apparatus that separate chromosomes during metaphase. Colchicine also has an inhibitory cause on various phosphatases<sup>21</sup>. Gloriosine also has an anti-mitotic effect. Severe cardio toxicity following GSb poisoning has been previously documented. Fatal complications that lead to death include haemorrhagic complications, multi-organ failure and infective complications.

## **SYMPTOMS**

Within a few hours of the ingestion of a toxic quantity of plant material, a victim may experience nausea, vomiting, numbness, and tingling around the mouth, burning in the throat, abdominal pain, and bloody diarrhea, which leads to dehydration. Colchicine is known to cause alopecia. . Later it progresses to haemodynamic instability, delirium, loss of consciousness, convulsions, respiratory distress, coagulopathy, renal failure or multi-organ failure and progressive polyneuropathy that occur within 12–36 hrs. . Severe hair loss is a well-recognised feature of GSb poisoning.

GSb poisoning has been reported from Sri Lanka and South India. A retrospective study conducted on poisoning in 1990 in the western Sri Lanka revealed that it was responsible for 44 % of plant poisonings with a 15 % case fatality rate.

## **PRECAUTIONS**

Use with extreme caution and only under guidance of a qualified practitioner. Keep the tubers and the seed capsules away from pets and children and do not let the sap come into contact with your mouth or eyes while working with them, as it can cause skin irritation. The tubers are poisonous to grazing stocks also so we should make sure to plant Gloriosa at a fixed place in the field in order to avoid gloriosa poisoning.

## CHAPTER 6

### *Alocasia sandariana*



Kingdom:     Plantae  
Clade:        Tracheophytes  
Clade:        Angiosperms  
Clade:        Monocots  
Order:        Alismatales  
Family:       Araceae  
Genus:        Alocasia  
Species:      *Alocasia sandariana*

Alocasia is a genus of rhizomatous or tuberous, broad-leaved, perennial, flowering plants from the family Araceae. There are 97 accepted species native to tropical and subtropical Asia and Eastern Australia. Around the world, many growers widely cultivate a range of hybrids and cultivars.

Alocasia sanderiana, commonly known as the kris plant or Sander's alocasia .It is endemic to Northern Mindanao in the Philippines, but is commonly grown as an ornamental plant worldwide. It is classified as critically endangered in the wild by the International Union for Conservation of Nature. It is known as the kris plant because of the resemblance of its leaf edges to the wavy blade of the kalis sword (also known as kris or keris). It is a tropical perennial, with upright leaves, usually growing to a height of 2 ft (60 cm) long.

Alocasia Sanderiana is one of the most impressive Alocasia varieties that can be grown indoors.It usually has a single to a few leaves, which are deep glossy dark green to blackish-green, often with large white to yellowish veins and margins. Leaves are long and pointed from rhizomatous clumps and reach an average of 18 inches (45.5 cm.) in length.

Alocasia indoor planting requires conditions that closely replicate its natural outdoor environment, which is warm and very humid. It is particular about its soil and light conditions and needs to be planted in a specific way.

## **POISONOUS CONTENTS**

Eventhough it is a famous indoor plant it is highly poisonous to dogs, cats, horses and humans and can cause death if consumed. If it touches the skin, the alocasia can cause skin irritation. Every part of this plant is poisonous. The calcium oxalate crystals found in the plant have sharp edges that cause irritation on everything that they touch. Alocasia plants contain insoluble oxalate crystals similar to other plants in the Araceae family. Chewing or biting into this plant will release these crystals causing tissue penetration and irritation the mouth and GI tract. It contain a protein called asparagine and oxalic acid, which cause poisonous reactions to those who eat the plant.

## **SYMPTOMS**

After consuming the alocasia, intense burning occurs on the mouth and lips. Drooling, vomiting and a difficulty swallowing can occur. If the alocasia gets in the eyes, it can cause redness, pain, swelling and burning in the eyes. Diarrhea can occur later, according to North Carolina State University. Death is caused by the swelling blocking the airways, though the swelling is usually not severe enough to cause this. If it touches the skin, the alocasia can cause skin irritation.So when handling the alocasia, protective gloves should be worn in order to prevent skin irritation.

## **PRECAUTIONS**

Those who consume the alocasia should wipe their mouths out with a cold, wet cloth and should drink milk. They should then contact a poison-control center. The poison-control center should be notified about the size of the individual who swallowed the poison, how much of the plant the individual ate, what part of the plant the individual ate and how long ago the plant was consumed. Patients who experience diarrhea should drink plenty of fluids in order to replace the electrolytes that they lost from the diarrhea after they have received permission from the poison-control centre.

## **MEDICINAL USES**

This Alocasia plants have a lot of medicinal uses also. The leaves are said to be antimicrobial, antifungal, antioxidant, hepatoprotective, antidiarrheal, and antiprotozoal. The leaves and the rhizome are used in the treatment of impetigo, furunculosis, phlegmon and snake-bite in the form of a liquid extract for administration by mouth, and their residue is used for poulticing. They are also used in treating colic and vomiting, in a daily dose of 10 to 20g of dried rhizome in the form of a decoction. The rhizome is used to make a plaster that is applied topically and is said to be effective against furunculosis. The roots are used to treat swollen lymph glands. The wood is used to treat stomach-ache and diarrhoea. The leaves and rhizomes are collected throughout the year. The leaves are used fresh. The rhizomes are boiled hard to reduce itching compounds, then sun-dried or heat-dried.

This plant has some Agroforestry Uses like it grows rapidly in wetland conditions and has a propensity to accumulate metal contaminants such as zinc. It shows promise for use in sewerage treatment beds.

## CHAPTER 7

### Major plant toxins and its classification

Over millennia, through the process of natural selection, plants have evolved the means to produce a vast and complicated array of chemical compounds to deter herbivores. Tannin, for example, is a defensive compound that emerged relatively early in the evolutionary history of plants, while more complex molecules such as polyacetylenes are found in younger groups of plants such as the Asterales. Many of the known plant defense compounds primarily defend against consumption by insects, though other animals, including humans, that consume such plants may also experience negative effects, ranging from mild discomfort to death.

Apart from harmful effect, these chemical compounds also have nutritious and beneficial to health. It serves as superb tools to study cellular and other mechanisms, and enhanced knowledge about the plant toxins may give us new products for use in medicine.

#### CLASSIFICATION OF TOXICITY

- 1) Major toxicity: These plants may cause serious illness or death.
- 2) Minor toxicity: Ingestion of these plants may cause minor illnesses such as vomiting or diarrhea.

#### NATURAL PLANT TOXINS

Natural toxins may be present inherently in plants. They are usually metabolites produced by plants to defend themselves against various threats such as bacteria, fungi, insects and predators, which may be species specific and give the plant its particular characteristics, e.g. colours and flavors. Common examples of natural toxins in food plants include lectins in beans such as green beans, red kidney beans and white kidney beans; cyanogenic glycosides in bitter apricot seed, bamboo shoots, cassava, and flaxseeds; glycoalkaloids in potatoes; 4-methoxypyridoxine in ginkgo seeds; colchicine in fresh lily flowers; and muscarine in some wild mushrooms

#### CLASSIFICATION OF PLANT TOXINS

##### ALKALOIDS

These are some of organic compounds containing nitrogen in heterocyclic ring, basic in nature and derived from amino acid, most of which exhibit strong physiological activity. For

example: Indole alkaloids: beta-carbolines like harmine active on the central nervous system  
Pyrrolizidine: veno-occlusive disease of the liver  
Tropanes: atropine, scopolamine, hyoscyamine active on the autonomous nerve system  
Glycoalkaloid: The greatest worry for glycoalkaloid toxicity is its acute toxicity. There have been many reported cases of human poisonings (sometimes fatal) due to the ingestion of greened, damaged or sprouted potatoes as a consequence of high levels of glycoalkaloid. that is solanine (Maga 1980).

## **GLYCOSIDES**

These substances consist of a non-sugar moiety that is, aglycone to which one or more sugar chains is bound. Cyanogenic glycosides release prussic acid. The cyanide ions (CN<sup>-</sup>) attach to the mitochondrial cytochrome oxidase and in this way blocks electron transport. The clinical symptoms of acute cyanide intoxication can include: rapid respiration, drop in blood pressure, rapid pulse, dizziness, headache, stomach pains, vomiting, diarrhea, mental confusion, stupor, cyanosis with twitching and convulsions followed by terminal coma. Cardiac glycosides such as digitoxin from foxglove. Digoxin inhibits the enzyme Na-K-ATPase. Vomiting, confusion, changes in colour perception and in particular, cardiac arrhythmias are dominant symptoms. Too much ingestion of Goitrogenic glycosides along with simultaneous iodine deficiency may lead to thyroid disorders.

## **TANNINS**

These substances have the capability to precipitate proteins. They make the skin tough by deception of the proteins in the skin.

## **PROTEINS**

A number of protein toxins produced by plants enter eukaryotic cells and inhibit protein synthesis enzymatically. Examples of poisonous proteins include ricin (castor plant), abrin (rosary pea) and white acacia. Lathyrism occurs due to a toxic amino acid that mimics glutamate.

## **OXALIC ACID AND OXALATES**

Oxalates: The juice or sap of crystals. These needle-shaped crystals can irritate the skin, mouth, tongue, and throat, resulting in throat swelling, breathing difficulties, burning pain, and stomach upset. These substances may be present in trichomes or in raphides (needle-like structures). They can provoke mechanical irritation. Ingested oxalate will be absorbed. Oxalate in blood binds calcium to form the insoluble calcium oxalate. Severe hypocalcemia with tetany can occur.

## **ANTI-VITAMINS**

Some substances work against the vitamins, for examples. thiaminases in horsetails and bracken (breakdown of thiamine) and anti-vitamin K such as coumarins.

## **VOLATILE OILS**

Volatile oils are liquid substances formed in special oil cells, glands, hairs, or channels. They are all soluble in alcohol. At certain concentrations, some are irritant (forming blisters) and emetic. Some volatile oils are nephrotoxic Omally.

## **FUROCOUMARINS**

These toxins are present in many plants such as parsnips (closely related to carrots and parsley), celery roots, citrus plants (lemon, lime, grapefruit, bergamot) and some medicinal plants. Furocoumarins are stress toxins and are released in response to stress, such as physical damage to the plant. Some of these toxins can cause gastrointestinal problems in susceptible people. Furocoumarins are phototoxic, they can cause severe skin reactions under sunlight (UVA exposure).

## **LECTINS**

Many types of beans contain toxins called lectins, and kidney beans have the highest concentrations especially red kidney beans. Raw beans can cause severe stomachache, vomiting and diarrhea. Lectins are destroyed when the dried beans are soaked for at least twelve hours and then boiled vigorously for at least 10 minutes in water.

## **SOLANINES AND CHACONINE**

All solanacea plants, which include tomatoes, potatoes, and eggplants, contain natural toxins called solanines and chaconine which are glycoalkaloids. While levels are generally low, higher concentrations are found in potato sprouts and bitter-tasting peel and green parts, as well as in green tomatoes. The plants produce the toxins in response to stresses like bruising, UV light, microorganisms and attacks from insect pests and herbivores.

## **POISONOUS MUSHROOMS**

Wild mushrooms may contain several toxins, such as muscimol and muscarine, which can cause vomiting, diarrhea, confusion, visual disturbances, salivation, and hallucinations. Onset of symptoms occurs 6–24 hours or more after ingestion of mushrooms.

## **MECHANISM OF ACTION OF PLANT TOXINS**

The mechanism of toxicity of plant toxins is of great interest because they are present in foods used in ethno medicine in cosmetics and have broad range of medicinal applications.

### **NEUROTOXINS**

The neuroactive alkaloids can function either as agonists which excite a neuroreceptor or as antagonists which would block a certain neuroreceptor. Receptors on neuron cells are another major target for many of alkaloids, such as glutamate, acetylcholine, dopamine, noradrenalin, and adrenaline. Some alkaloids inhibit the enzymes that break down neurotransmitters, such as cholinesterase and monoamine oxidase. Neurotoxins also have an effect on significant ion channels of neuronal cells, such as Na<sup>+</sup>, K<sup>+</sup> and Ca<sup>2+</sup> channels, whichever by activating or inactivating them eternally.

### **CYTOTOXINS**

Many Phyto constituents are regarded as cytotoxins as they obstruct important cellular functions. Bio-membrane are prime target of such compounds which are involved in the import and export of metabolites and ions in cells. Membrane fluidity and integrity can be severely disturbed by both steroidal and triterpenoids saponins.

## **PLANT TOXIN POISONING OCCURRENCE**

Consumption of plants not intended for human consumption: Some wild plants, such as wild mushrooms and giant elephant ears, contain potent toxins that are not easily destroyed by cooking. Cyanogenic plants such as bitter apricot seeds can cause food poisoning when eaten raw and in sufficient amount but are safe for consumption when thoroughly cooked in boiling water, such as in Chinese soups. For plants such as cassava and bamboo shoots, toxic cyanide can be removed more effectively by soaking in water or by cutting into small pieces before cooking.

## **TOXICOLOGICAL EFFECTS OF PLANT TOXINS**

### **PHYTO DEMERITS AND PHYTO PHOTOMERITS**

Some substances secreted from plants have an irritant effect on the skin after being irradiated by UV light. Mango and many other trees known to cause irritation skin on contact. Phyto photo dermatitis also known as dermatitis. The skin lesions are similar to burns. There is a delay between the skin contact and the first signs of irritation.

## **PHYTO ALLERGY**

Hay fever caused by pollen from ragweed, birch, hazel, timothy grass and rye grass are common case of Phyto allergy. Urticarial resulting from eating strawberries and allergy to peanuts are some other recognized allergy conditions due to phytoconstituents. Some phytoconstituents cause certain forms of extrinsic allergic alveolitis.

## **FOOD POISONING**

Food poisonings provoked by plant toxins mainly due to consumption of foods such as beans that are partially cooked, some cultivars of potatoes, and ingestion of herbs selected from the wild not wished-for for human use such as poisonous berries and mushrooms.

## DISCUSSION AND CONCLUSION

Plant toxins are found widely in edible plants. The toxicity in plants which, as a whole or a part thereof under all or certain conditions, and in a manner and in amount likely to be taken or brought into contact with an organism, will exert harmful effects or cause death either immediately or by reason of cumulative action of the toxic property, due to the presence of known or unknown chemical substances in it, and not by mechanical action. Apart from harmful effect, these also have nutritious and beneficial to health. These substances may be alkaloid, glycoside, proteins, and tannins. These toxins are problem in correlation with different diseases, and there may be a risk as bioterror weapons.

These poisonous plants became significant problems in many areas of the world. Poisonous plants produce their toxic effects after being ingested and/or absorbed by animals which include physical upset, loss of productivity and death. Therefore, even though plants have vital nutritious and providing the normal atmospheric oxygen, it will cause life threatening if it is toxic.

Toxic plant poisoning is, as it is discussed, a public health problem. It also reveals us that intoxication by toxic plants is a significant cause of morbidity and mortality. But most of such cases are purely accidental, which can be avoided. As we have verified, right knowledge is the best way of prevention. This can be achieved by educating, imparting information and raising awareness among the general public about the problem. At the same time, such cases are to be reported to the health activists for urgent treatment. Above all, efforts can be made to have fruitful research, so that such toxic plants may be used as herbal medicines in right proportion, along with creating right awareness to the people.

Despite all the precautions we take, it is not always possible to prevent accidental poisoning. An easy method we can follow is to keep oneself away from such poisonous plants. If ever we want to touch them, do it only with hands wearing gloves. This can prevent the skin from the direct contact with sap Or juice of the plants. The plants in our garden outside, is as dangerous as the pets outside. Hence such plants must be hung high on porches and plant-stands. It has to be borne in our mind that the plants never sprew out the toxin into the environment. They release them only when the plant is injured, bocken touched or ingested. So always learn about the poisonous contents of the plants.

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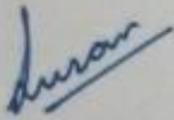


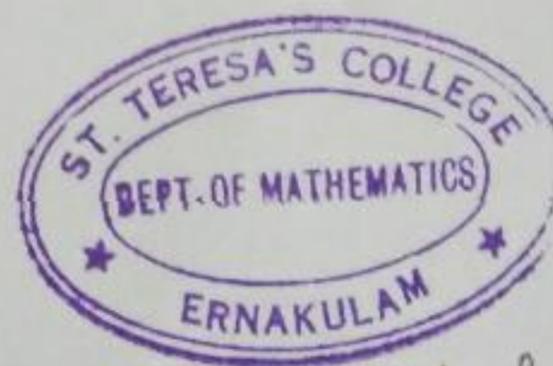
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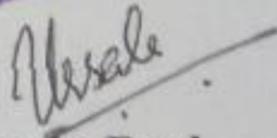
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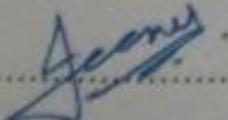
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# **A SOCIOLOGICAL STUDY ON THE LIFE OF SEX WORKERS IN KERALA**



**BY**

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SEARCH  
CLASS

**DEPARTMENT OF SOCIOLOGY AND CENTRE FOR RESEARCH  
ST. TERESA'S COLLEGE (AUTONOMOUS), ERNAKULAM**



**A SOCIOLOGICAL STUDY ON THE LIFE OF SEX WORKERS IN  
KERALA**

Thesis submitted to St. Teresa's College (Autonomous), Ernakulam in *fulfillment of the  
requirements for the award of the degree of Bachelor of Arts in Sociology*

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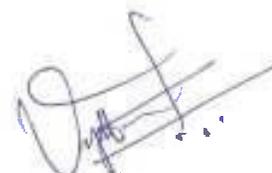
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**MARCH 2022**



## **CERTIFICATE**

I certify that the thesis entitled '**A Sociological study on the Life of Sex Workers in Kerala**' is a record of bonafide research work carried out by **Aiswarya Dinesh, Silpa Sunil V, Mariam Sk, Sharanya T Ramesh, Sneha TS, Lynn Pothanikkatt, Sandra Babu** under my guidance and supervision. The thesis is worth submitting in fulfillment of the requirements for the award of the degree of Bachelor of Arts in Sociology.



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**March 2022**

## **DECLARATION**

**We, Aiswarya Dinesh, Silpa Sunil V, Mariam Sk, Sharanya T Ramesh, Sneha TS, Lynn Pothanikkatt, Sandra Babu** here by declare that the thesis entitled '**A Sociological study on the Life of Sex Workers in Kerala**' is a bonafide record of independent research work carried out by me under the supervision and guidance of Ms.Vyshnavi Sivadas I further declare that this thesis has not been previously submitted partially or fully for the award of any degree, diploma, associateship or other similar title.

**Place: Ernakulam**

**Date: 15-03-2022**

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## **LIFE OF SEX WORKERS IN KERALA**

**An analysis of Nalini Jameela's autobiography- 'ORU LYMGIKATHOZHILALIYUDE ATMAKATHA' and Madhu Eravankara's 'PUNARAKHYANAM' documentary.**

**—Silpa Sunil V, Sandra Babu, Sneha T S, Sharanya Ramesh, Aiswarya Dinesh,  
Mariam S K and Lynn Pothanikkatt**

# CHAPTER 1

## INTRODUCTION

Prostitution and other transactional sexual relationships are particularly common in our society today. People have different views on the subject of prostitution. It is referred to as the oldest profession in the world: the practice of selling sex for cash or other immediate compensation has existed across cultures and times.

There are 40 to 42 million prostitutes in the world; three quarters of them are between the ages of 13 and 25, and 80% of them are female (*Fondationscelles, 2012*). Prostitution has been defined as the granting of sexual favours for monetary gain (*Giddens, 2010*). The word ‘prostitute’ began to come into common usage in the eighteenth century. Within the vulnerable group, sex workers stand out as being particularly vulnerable. Increasingly, prostitution and other activities in the sex industries have been conceptualised as forms of labour, or at least as income-generating activities. This research focuses on the life of prostitutes in Kerala using the reception of the autobiography ‘ORU LYMGIKATHOZHILALIYUDE ATMAKATHA’ by Nalini Jameela and Madhu Eravankara’s ‘PUNARAKHYANAM’ documentary.

### 1. BRIEF INTRODUCTION

#### **Prostitution in ancient India**

##### **Introduction**

In vedas and puranas women are regarded in a way that allows them to live in honour for their importance in society with respect and protection, and given the opportunity to reach their real potential in life.

There is a Vedic saying, “Where women are worshipped, there the gods dwell. Or where the women are happy, there will be prosperity.”

“Women must be honoured and adorned by their fathers, brothers, husbands, and brothers-in-law, who desire their own welfare. Where women are honoured, there the gods are pleased; but where they are not honoured, no sacred rite yields rewards. Where the female relations live in grief, the family soon wholly perishes; but that family where they are not unhappy ever prospers. The houses on which female relations, not being duly honoured, pronounce a curse, perish completely, as if destroyed by magic. Hence men who seek (their own) welfare,

should always honour women on holidays and festivals with (gifts of) ornaments, clothes and (dainty) food.” (*Manu Smriti III.55-59*). In Mahabharata, Grandfather Bhishma explains to Yudhistira before his death : “O ruler of the earth, the lineage in which daughters and the daughters-in-law are saddened by ill treatment, that lineage is destroyed. When out of their grief these women curse these households, such households lose their charm, prosperity and happiness.” (*Mahabharata, Anushasan Parva, 12.14*)

“When a woman is invited into the family through marriage, she enters ‘as a river enters the sea’ and rules there along with her husband, as a queen, over the other members of the family.” (*Atharva-Veda 14.1.43-44*). In early Vedic civilization women were always encouraged to pursue spiritual advancement without hindrance:

“O bride! May the knowledge of the Vedas be in front of you and behind you, in your centre and in your ends. May you conduct your life after attaining the knowledge of the Vedas. May you be benevolent, the harbinger of good fortune and health, and live in great dignity and indeed be illumined in your husband’s home.” (*Atharva Veda, 14.1.64*). During the times of Mahabharata, prostitutes were common during the reign of the Pandavas and Kauravas. They were an important part of the court and both dynasties possessed harems of aristocracy in Brahmanic India. Having concubines is common among the aristocracy. In Mahabharata courtesans of Indara Puri have been vividly depicted. Mahabharata has recorded the names of forty two apsaras in all. The stars amongst heavenly courtesans are Urvashi, Menaka, Tilottama, Rambha and Ghritachee. (*Pallavi Thakur, 2014*). Kautilya’s famous ‘Arthashastra’ contains rules for prostitutes and their activities and gives an account of how prostitutes should behave and how their lives are ordered. A code of conduct was prescribed, for people seeking their favour. They had certain definite prerogatives, rights and duties. (*Pallavi Thakur, 2014*). There have been various myths and legends about the origin of prostitution. For example, in the Mahabharata, the account of the destruction of the Yadavas ends with the women of these tribes being abducted. In Kuru and Pancala, the Brahmin sages were associated with the teachings of erotics, in which prostitution consisted of one section. Ksemendra says that wicked mothers often have their daughters away, to be enjoyed and abducted by other men. Vatsyayana in Kamasutra gave intrinsic details of how a chaste girl should be seduced cleverly until she fulfils a man’s lust. (*Devaanshi, 2022*). The Apsaras or the celestial nymphs were considered to be the portrayal of absolute beauty and feminine charms. Entertaining the guests in the courts of the Hindu Gods, these females were highly accomplished in music and dance. They were sent for Tapasya or penance and the devotion of saints. (*Devaanshi, 2022*). The Aryan system in India followed the footsteps of the heavenly

courts and developed a system of prostitution. Women were made to look like well-accomplished maidens in token of friendship with the kings. In addition, they were offered as ransoms in matters of politics. Several girls of different classes were carefully selected from infancy to become prostitutes. They were fed poisonous herbs and food and were called the Vishkanyas (Poisonous virgins). They were made prostitutes and used as a weapon by the kings to destroy their enemies. (Pallavi Thakur, 2014). Prostitution in the kamasutras An Indian sage of the third century B.C.- Vatsyayan- devoted several pages to prostitutes and their ways of life in his writing Kamasutra. It mentioned the rules of conduct and the popular trade system that happened. He stated that the prostitutes of today had their prototypes in the olden days. It describes different sports and festivals of the rich, in which courtesans were invited. (Pallavi Thakur, 2014)

### **Sculptures and painting**

Much of Ancient art was created for religious purposes, and the figurine is no exception. The goddess is crudely carved with no real indication of clothing or a body, and her hair is possibly the only reason the fact that she is a goddess is discernible.

In art, the physical features/reproductive organs of the women were usually exaggerated because it was believed doing so would bring fertility. (female antropomorphic figure "Venus", Unknown, 40th-5th century B.C)

The pose of the figurine is forced and rigid, the lines of her body geometric rather than curvilinear. The figurine in art and sculpture is a portrait in nudes. Prostitution in India can be traced back to archaeological findings of the Indus Valley. The bronze figure of dancing girl from Mohenjodaro represents a sacred prostitute carrying out her duties within the precincts of the temple of some mother goddess and this cult was quite well established in the Indus Valley Civilization. (Pallavi Thakur, 2014)

### **Treatment of women- Ancient India**

It is generally said that the state of development of a society can be judged from the status a woman occupies in it ( S.Jeevanandam, 2021). A woman performs a number of roles in the family, community and the wider social system. Her status in the society is determined by her composite status depending upon her various positions and roles. The role that a society assigns to women in real life determines the extent and level of her participation in the social,

economic, cultural and political processes which in turn shapes the demographic portrait of a country.

The status of women of Vedic era began to decline with time. Gender inequality started creeping into society. Slowly women's status degraded to such an extent that they were not given the freedom, which was available to even Sudras. They had been discriminated against in all walks of life, accentuating social, economic and cultural inequalities. The sex-based discrimination deprives them of exercise and enjoyment of human rights and fundamental freedoms in all spheres of life. They were debarred from religious practices. As Vedic age progressed, the status of women became worse. And till the time of Smirits (religious scripture of Hinduism) the condition became so bad that women were not allowed free access to education they were given education related to just domestic purposes. (S.Jeevanandam, 2021). The celestial nymphs were described as perfect embodiments and unsurpassed beauty and feminine charms. They are highly accomplished in music and dance. They entertained divinities and their guests in the court of Lord Indra, the Lord of Hindu Gods. They were also sent to test the real depth of 'tapasya' (penance) and devotion of great saints. An apsara named Menaka caused the downfall of the great sage Vishwamithra, and became the mother of Shakuntala, the immortal heroine of, Shakuntalam written by Kalidas. - (Pallavi Thakur, 2014)

### **Devadasi**

There was a custom where girl children were used to dedicate to the 'Hindu' temples for the religious service to the deity in the name of devadasi. The system became an important cultural element in mediaeval Indian society. The system evolved with its unique functionality in the Indian tradition. The dedicated young girls came from different castes and assigned duties accordingly. However, it was not classified as a separate caste. It became an interesting historical question. This particular paper focused on the devadasi custom and its caste dynamics in the historical past. (S.Jeevanandam, 2021). Devadasi the word derived from the Sanskrit words 'deva'(God)and 'dasi' (servant or slave), Devadasi's were women and girls dedicated through marriage to different Gods and Goddesses, a system that originated in South India around the 6th century . After their dedication they became the wives of the deities and performed various temple duties, including cleaning the premises, gods ornaments, items in the temples, dancing for deities in the festivals, and delivering prayers and food to Gods, all of which were sacred forms of worship .As wives of deities, Devadasi

never attained the socially and morally stigmatised status of widowhood, and this was the primary reason for their auspiciousness.

( *N. Janardhana 2017*). Caste is an ‘integral component’ of Indian society. Almost all the social groups in the Indian subcontinent have their specific rites and rituals. It consolidated them within certain compartmentalised caste categories. In this context, there was a custom where girl children were used to dedicate to the ‘Hindu’ temples for the religious service to the deity in the name of devadasi. The system became an important cultural element in mediaeval Indian society. The system evolved with its unique functionality in the Indian tradition. The dedicated young girls came from different castes and assigned duties accordingly. However, it was not classified as a separate caste. It became an interesting historical question. This particular paper focused on the devadasi custom and its caste dynamics in the historical past. ( *S.Jeevanandam, 2021* ).

### **Advantages**

In the past, the custom was widely spread in South Asia, especially in India and Srilanka. They were an integral part of the temple organization. Unlike the other women in the patriarchal society, the dedicated girls were educated, owned property, sexually free and had certain other privileges such as holding their flags and the special funeral rites which was not even confirmed to ‘caste’ men in the society. They were a respected member of the society. ( *Rekha Pande, 2017* ) Girl children were used to dedicate to the ‘Hindu’ temples for the religious service to the deity in the name of devadasi. They were married to a deity or god, but that did not mean that she had to live her life without the normal pleasures of sex and childbearing. ( *S.Jeevanandam, 2021* ).

### **Limitations**

Devadasi or Devaradiyar means “servant of God ". These women were dedicated to God and were considered given in marriage to God, meaning that they could therefore not marry any ‘mortal’. Nevertheless, they were free to choose partners, from among married and unmarried men alike. These relationships could be long and stable, or just for a short period of time. But in no way were these women economically dependent on their partners. Some chose to dedicate themselves only to God and stayed without a partner all through their life. As part of the ritual, girls are dressed as brides and once the ceremony is over, their dresses are

removed by five boys, virtually leaving them naked. They are then forced to live in the Mathamma temples, deemed to be public property, and face sexual exploitation, according to the NHRC.(*K.Umashankar- Oct 2017*).

## **Decline**

Beginning in the 19th century or perhaps even earlier, however, the social and economic position of devadasis began to decline for two main reasons:

1. The first reason was that temples were systematically destroyed under Mughal Rule.(*Shreya Shankar, 2021*)
2. The second reason was that the nationalist movement unleashed new definitions of social morality.
3. An additional factor was that the middle-class elite of Madras, like their counterparts in the North, began to try to resurrect traditions of classical music and dance by making them more Broad-based.
- 4.The advent of colonialism that followed.(*Rekha Pande, 2017*).

Later there was a historical development and transition of the devadasi system from the early mediaeval to modern .

## **Emergence of Prostitution**

What is prostitution? The act of practicing or engaging in sexual relations especially for money is prostitution. Prostitution was first discovered in 2400 BCE. The term was introduced by the devadasi system. Later term changed to Sex workers. Sex worker was coined by Carol Leigh at the 1970s.

These people who hide from society and get paid from work. Sex worker was coined by Carol Leigh at the 1970s.

Prostitution is described as one of the oldest professions in the world. It was traced by the early civilization in the world. When laws were brought to the system gender equality and empowerment of women started to resemble. ( *B.B. Sahoo, 1997* ). Girls in India continue to be sexually abused/exploited under the veil of traditional practices such as Devadasi dedication despite the existence of legislation meant to protect them from child sexual abuse. It underscores the need to address this practice as a criminal offence to be prosecuted under the legislation. According to one's view, prostitution is different from sexual exploitation, or the forcing of a person to commit sexual acts, and is seen as the commercial exchange of sex

for money or goods". Proponents of legalizing prostitution believe that it will go a long way to reduce crime, improve public health, increase income, help people out of poverty and allow consenting adults make their own choices. An economic transaction which involves exchange of something of economic value and emotional difference-though the participants may enjoy the affinity at the period but their interaction has nothing to do with affection for one another (Dallas, 2002). Despite their vulnerability, prostitutes remained a largely invisible, inadequately served and marginalised population. Most prostitutes wanted to protect themselves and have a business that was legitimate, with minimal risks to safety. Sex work was the work they had chosen to do when there were no other real options.

## **Problems faced by them**

### **Social Exclusion**

Social exclusion is commonly defined as a series of linked and/or mutually reinforcing processes, such as low income, poverty, debt, unemployment, poor education, health problems, housing problems, crime, lack of social support and other adverse life events (*Bradshaw et al., 2004*). Experience of these can lead to vulnerability and exclusion from enjoying the rights of employment, health care, secure housing and a decent standard of living (*Popay, Poval and Mathieson, 2012*). Sex workers face lot of discriminations. Discrimination can take many forms, such as racism, stigmatisation and prejudice. It can prevent social inclusion, driving marginalisation and vulnerability (*NSWP, 2008*). Both sex workers and people living with HIV experience social exclusion, isolation and discrimination from their families and communities. Even where sex workers living with HIV have the support of their families, they may be driven out of their communities, removing them from the support that they do have. Social exclusion increases the vulnerability of sex workers living with HIV to violence, drug use, negative health outcomes, poverty and mental health issues. (*NSWP, 2010*).

### **Health Care**

Sex workers and people living with HIV frequently experience stigma and discrimination when accessing health care. When accessing health care, sex workers living with HIV may have their status blamed on their sex work. Some health care workers may treat sex workers living with HIV as less deserving of appropriate and respectful care, and they may experience:

- Denial or delay of health care.
- Breach of confidentiality.
- Health care providers who are indiscreet, judgemental and stigmatising.
- Mandatory or coercive testing and treatment. •

Mandatory or coercive sterilisation or abortion.

• Lack of prevention of mother-to child transmission. Sex workers living with HIV may also be subjected to unethical treatment in clinical trials. Stigma and discrimination can cause sex workers to avoid getting tested, and sex workers living with HIV may not access the treatment they need. (*NSWP- Global network of sex work projects-2010*). Different types of sex work are associated with different levels of risk and thus have different implications for health. Low risk sex work activities, such as stripping and non-contact sex work, are less likely to be associated with adverse health problems (*Harcourt and Donovan, 2005*). The lower risk activities are not discussed in any great length within the sex work literature, likely because the vast majority of literature on sex work focuses on activities which involve higher levels of risk to both sex workers and the wider public; by and large, commercial sex work. It is widely acknowledged that many sex workers still engage in risky behaviour, such as having sex without a condom, research suggests 8 condom use amongst sex workers has increased over the last 30 years and incidents of HIV have decreased over the same period (*Scambler and Paoli, 2008*). Sex workers must continue to get the sexual health support they require to enable them to play their role in preventing sexual health epidemics (*Cusick and Berney, 2005*). The consequences of physical violence can often lead to poor physical health, as well as poor mental health due to trauma (*Rosler et al., 2004*). At its most extreme, violence against sex workers leads to death. Drug addiction amongst sex workers is typified by a 'work-score-use' cycle (*Jeal, Salisbury and Turner, 2008*).

## **Economic**

Sex workers living with HIV experience housing and economic discrimination. They are unable to fully participate in formal economies and face discrimination. They may be:

- Evicted from their homes.
- Refused rentals.
- Denied the ability to own property.
- Dismissed from their jobs.
- Forced to leave their community to find work.

- Denied loans and bank accounts

*(Cheryl Baxter, 2010).*

Commentators, such as Brents and Sanders (2010), stress the importance of financial drivers which often push people into sex work. The range of factors, in which issues like poverty, housing and poor education play a major role, interact to shape the health and well-being of sex workers (*Marmot Review Team, 2010*)

## **Political**

Globally, sex workers and people living with HIV experience severe stigma and discrimination, such as:

- Violations of their human rights.
- Repressive laws and policies.
- Lack of access to protection and justice.
- Violence.

Sex workers living with HIV often cannot access equal protection from law enforcement or justice when they report offences committed against them, such as violence, rape and robbery. Sex workers who report offenses may not be taken seriously, and are at risk of experiencing further violence at the hands of the police or being prosecuted for doing sex work. (*SWP, 2010*)

## **Radical feminist view**

Radical feminist analyses of prostitution tend to be centred around the issue of harm, both the harm done directly to women in systems of prostitution and the harm done to women as a class through the existence of systems of prostitution . Radical feminist theorising on prostitution often emphasises the violence that many women in prostitution suffer at the hands of pimps and johns, but the harm caused through the prostitution acts themselves is also focal point . That is to say, acts of prostitution are seen as harmful in and of themselves even if there is no additional physical violence. (*Meagan Tylor, 2020*)

## **Policy Challenges**

Because of the difficult circumstances for sex workers in India, even relative to that of other women, it is important to explore ways to improve their economic and social well-being. One

popular method is to "rescue" sex workers by force, thus reducing the exploitation said to be characteristic of the sex industry, and then to offer the rescued workers alternative sources of employment or relocation to place of origin. Methods to restrict entry, such as a ban on trafficking women and girls, would be a natural accompaniment of this approach. In practice, groups that consider sex work as immoral are likely to favor both forcible removal of sex workers and restraints on entry into sex work, so that it is not always clear whether the policy stems from the desire to impose a particular moral perspective or to improve the well-being of sex workers. A second method is to reduce the level of exploitation in the sex industry itself-by legalizing sex work or by protecting the civil liberties and political rights of sex workers-and to place restrictions on trafficking and address exploitation by brothel owners. The Indian policy approach, at least in the statutes, has been to try to achieve a mix of the different methods, with a careful balance between the views that sex work is immoral, that the sex trade is exploitative, and that sex worker rights need to be protected. The Indian government's approach has not been very successful in protecting the rights of sex workers or improving their well being. A human rights approach focuses on the legal rights of sex workers to address abuses that they face and emphasizes recognition of their civil liberties, such as custody of children, social security, minimum pay, and soliciting for clients. Its proponents include many nongovernmental organizations (NGOs), and its hallmark is the active participation of sex workers in the struggle for rights.(NSWP -2021). Over the last decade government legislation has attempted to tackle prostitution by criminalising many aspects of sex work (*Home Office, 2004*). However, these policies have been criticised by commentators for failing to address a wide range of issues, including the health and poverty of sex workers; and contributing to the difficulties experienced when trying to find pathways out of sex work. Factors which lead to sex work, such as poverty, unemployment, inequality, debt and vulnerability (and how to tackle them), have largely been overlooked by policies (*Cusick and Berney, 2005*). Government policies have neglected the complex needs of sex workers, criminalising sex work and thus forcing sex workers into even more marginalised and vulnerable positions. This subjects them to increased likelihood of violence, poor health, addiction and an inability to escape their situation (*Boynton and Cusick, 2006*). Finally, the behaviour of both the police and criminal justice system discourage sex workers from reporting violence and other crimes. Often, investigations tend to focus on the crimes relating to sex work instead of the crimes originally being reported. As a result, sex workers feel they cannot safely report crimes as they fear being treated like criminals and not as a victim (*Boff, 2012*).

## 2. Sex Industry in India

Asia has become the nucleus for the sex industry, including sex tourism. The sex industry has become a high-stakes business, with huge profits for brothel keepers, pimps, procurers, recruitment agencies, airline companies, hotels, travel groups, marriage bureaus and many others (Huda, 2006). The sex industry in Asia is often glamorized by including different ethnicities. It is the power of obtaining submissive women and children that make trafficking profitable to its consumers hence making the sex industry a lucrative business where multiple agents can make a profit. The sex industry in India is divided into different sections, such as brothels, escorts and street sex work. Street sex workers are the most vulnerable to abuse; these women solicit clients on the streets, in parks and other public areas. An escort is when clients contact sex workers by phone who provide a service in hotels. Most escorts have a high-end clientele and are therefore less likely to be abused. Women in brothels are either trafficked or exploited and they live in a certain area and are explicitly dedicated to providing services. In this thesis, I will be focusing on women working in brothels. In the majority of these segments of the sex industry, women are sold and trafficked to the major cities in India. Huda (2006) states that a new definition from the Indian government under the Immoral Traffic (Prevention) Act (ITPA) describes sex work as ‘sexual exploitation’ or abuse of persons for commercial purposes. The sex industry in India is full of tragedy, victimization and struggle, and embedded within it all are the suppressed voices of the women. Magar (2012) believes that “constructing sex workers as victims relinquishes the opportunity to allow sex workers in the rehabilitating center to overcome structural barriers” (p. 624). There are different degrees of empowerment or oppression; however, sex workers are unable to achieve justice when society paints them as victims or deviants. One of the ways to break away from these images of marginalization and victimization is to analyze the experiences of women in India who have been rehabilitated out of the sex trade industry and are in the process of reintegrating into society. In Mohanty’s article (2000) “Under the Western Eyes,” the author implies that women in the third world are labelled as ‘powerless’, ‘exploited’ and ‘sexually harassed’ among economic, legal and social discourse. This representation of women in the third world as underprivileged, marginalized and stigmatized prevents them from reintegrating into society. Even though the sex industry has been tainted with this image of women being powerless, the formation of the raid and rescue model might transform the images of women in the sex industry. Raid and rescue models are key aspect of government

interventions to address human trafficking. The raid and rescue model and the rehabilitation of women in the sex industry look different in every country. Magar (2012) defines raid as law enforcement officers entering a brothel or a space that is occupied by the sex industry. In most scenarios, law enforcement officers enter the brothels unannounced and remove the survivors from the brothels violently. Bandhyopadhyay et al. (2009) state that law enforcement officers never take the time to understand the issues and feelings of the rescued and instead violate their rights. Magar (2012) defines rescue as the removal of a person affected by human trafficking from trafficking situations, such as people coerced to work in the brothels. Magar (2012) defines rehabilitation as a process where survivors are taken to a space to be free from physical, emotional, and social impacts which is a result of the exploitation they face in the sex industry. In these centres survivors will receive psychological counselling, economic assistance, legal assistance, shelter and socio-cultural redemption. Bandhyopadhyay et al. (2009) state that rehabilitation programs are vital in assisting the return of survivors into their communities. Women coming out of the sex industry are often placed into rehabilitation centers. In these centres they receive individual counselling sessions which can span several months to years, in addition to training sessions that provide them with new skills that they can use to find more sustainable job opportunities to support themselves and their families. “Rehabilitation centers to which sex workers are sent vary greatly, with reports of some safe homes described as “jail like” by sex workers” (Stanton, 2015, p. 40) This research addresses a gap in scholarly literature. As there has been academic attention towards rehabilitation centers for sex workers that focus solely on counseling sessions, researchers have identified the rehabilitation process as harmful and further victimizes and stigmatizes women who have been rescued from the sex industry. There are limited studies that primarily focus on how the combination of counselling and training sessions may have a positive or negative effect on taking women sex workers out of the sex industry and reintegrating them into society. The rationale for this research study is to shed light on the oppression women in the sex industry face daily. This research will highlight the multi-causal factors or reasons why women enter the sex industry and the challenges they face to leave the industry. Although this research study will not be able to directly benefit the participants within the timeframe of the project, I hope the long-term indirect outcomes create potential avenues for recommendations that can empower women rather than criminalize and stigmatize sex workers in India.

### 3. The Sex Industry Globally

The World Health Organization (*WHO*) defines sex workers as “women, men and transgendered people who receive money or goods in exchange for sexual services, and who consciously define those activities as income generating even if they do not consider sex work as their occupation” (*WHO, 2002, p. 2*). The WHO defines exploitation as being “coerced or deceived into providing sexual services and treated as commodities by criminals. They are forced to work very long hours for little or no pay, threatened with violence if they do not comply and are often debt bonded to their trafficker – being told they have to keep working until the alleged debt is repaid” (*WHO, 2002, p. 8*). These individuals who are being exploited are stripped of their dignity and their human rights. For many women around the world, sex work is a choice they make themselves. However, for many women in third-world countries like India, there may be multiple social factors that force women into the sex industry and therefore they become exploited. In the past, the term “human trafficking” was used in reference to the kidnapping or enslavement of people (*Misar, Mahal, and Shah, 2000*). However, over the past years, the word trafficking has evolved into different categories. The United Nations (*2002*) defines: “Trafficking in persons as the recruitment, transportation, transfer, harbouring or receipt of persons, by means of threat or use of force or other forms of coercion, of abduction, of fraud, of deception, of the abuse of power or of a position of vulnerability or of the giving or receiving of payments or benefits to achieve the consent of a person having control over another person, for the purpose of exploitation. Exploitation shall include, at a minimum, the exploitation of the prostitution of others or other forms of sexual exploitation, forced labor or services, slavery, or practices similar to slavery, servitude or the removal of organs.” A person who is trafficked may have been emotionally, sexually, and/or physically exploited. Poverty’s breakdown of social infrastructures and heightened gender inequalities makes the perfect environment for agents to recruit young women and children for the sex industry (*Chattopadhyay & Mckaig, 2004*). For some agents, lack of opportunity and extreme poverty creates a fertile environment for traffickers to lure young women into cities where the sex industry is thriving. In many countries, aesthetically the sex industry can look very different. Some brothels look very similar to slums, traditional practices such as the Devadasi system. However, sex tourism has evolved and seeped into society so that now it can be found in public places such as train stations. Since buyers can pay for these commodities, women are very easily bought for a

significantly low price. Poudel (1994) implies that while the sex industry is prospering in countries like Thailand, the Philippines, India and Nepal,, these countries also suffer the highest rates of HIV/AIDS spreads amongst their growing population. The media has captured the stories of women who are kidnapped and tortured within the sex trade industry and has deemed brothels as sites of torture and exploitation (*Loomba and Lukose, 2012*). These stories and reports have painted an image of torture and exploitation by pimps, madams and clients and these images have classified them as villains and have painted the women as either voiceless victims or criminals of society.

#### **4. . Statement of problem**

The researchers intended to choose the topic because it is something which is very common in our society. Everyday you could see articles or news about them. The news and articles brought a new perspective and aspects which could be used for research. Prostitutes are regarded as people who probably lacked proper upbringing, have no shame; loose. and easy women. So, as a researcher, it is important to let the world know the actual truth about them. Therefore, This research focuses on the life of prostitutes in Kerala using the reception of the autobiography ‘ ORU LYMGIKATHOZHILALIYUDE ATMAKATHA ’ by Nalini Jameela and Madhu Eravankara’s ‘PUNARAKHYANAM’ documentary. The autobiography has won the Kerala State film special jury award. Her life documentary was a joint venture of the United Nations Development Programme (UNDP). Madhu Eravankara is a scholar who has won Kerala state film award for best documentary. Madhu Eravankara describes the despair and agony faced by the sex workers of Perumbavoor. Thus, it gives a great insight about the lifestyle of the sex workers in Kerala. The field survey was done on a sample basis across Perumbavoor Kerala. The samples are collected from female sex who now work as the waste collectors of Government's Haritha Keralam project. Kerala is a work hub for other state labourers and as per reports, sex workers from other state are also coming into the state at a high rate. Most of the women are from Bengal, Bihar and Odisha. The discovery was made through a survey by Kerala Aids Control Society. In the survey, it is said that some agencies are also bringing in women. These women reach the state under the guise of being relatives and then move on to sex work. A significant number of these sex workers are found in Perumbavoor. The main study objective was to enhance understanding of the experience of prostitutes in Kerala. The specific aim of this study was to analyse the causes of prostitution,

to know about the protests, fights initiated by the prostitutes in Kerala, and to understand how sex workers survive against social taboos. (News article-*Kerala Kaumudi*, 2019).

## **GENERAL OBJECTIVE:**

1. To understand the experiences of prostitutes in Kerala.

## **SPECIFIC OBJECTIVES:**

1. To analyze the causes of prostitution.
2. To know about the protests, fights initiated by the sex workers in Kerala.
3. To understand the medical conditions sex workers suffer.
4. To understand the level of life satisfaction among prostitutes in Kerala
5. To compare the experiences of prostitution in Kerala with those from elsewhere.

## **5. Significance of the study**

Sex Workers are going through a pathetic situation which can exploit their personal life.

The significance of this study is to show the destitute life's of sexworkers in Kerala. To look deep into their lifestyle , the problems they face, the health hazards they are going through etc. Sex Workers have many health issues because of their arduous job.

Sex Work is a job which has more risks compared to many other. On the other hand they are facing lots of awful situations because of the mentality of the society , they are avoided because of the role they play in the society. They face discrimination, health care stigma and many more. Sex work was the work they had chosen , when there were no other options. These were the problems they faced because of only one reason: their work job is not legal. This illegal work was not acceptable by society. Recently, the researcher's have been hearing a lot of issues and problems facing by the sex workers. The business of sex has overtime undergone various name rebranding- from whores, sluts, harlots, tramps, to hookers, prostitutes and now sex workers (*Siegel, 1983*). Without realising the real situation, Prostitutes are regarded as people who probably lacked proper upbringing, have no shame; loose and easy women. This research, will be useful for the government to take proper action

, policy, schemes to protect them. It is a high time to let the others know about the real condition of the sex workers, because they are part of the society and it is important to protect these people.

## CHAPTER 2

### REVIEW OF LITERATURE

The sex industry in India is full of tragedy, victimization and struggle, and embedded within in it all are the suppressed voices of women. The purpose of this research is to understand the experience, structures, process and policies that allow former sex workers to rehabilitate and reintegrate into society. When analyzing the structures, this research uncovered the resources and tools available to sex workers to reintegrate into society, such as learning a new skill, counseling sessions and becoming financial independent by obtaining a job. Understanding the victimization of sex workers through police brutality and stigmatization of sex work was fundamental to understanding the challenges of reintegration into society. This study was developed to give women who are in the sex industry an opportunity to share their stories, experiences and contribute to scholarly literature. This literature review will follow the theoretical approach to gain insight into the research topic. For this purpose, the researcher will collect all kinds of relevant information related to the context of various prostitution system and policies spread all over the world. The research will summarise the research approaches and results attained by the former researchers and will attempt to meet the research aim and objectives.

1. prostitutes of god - Vice news, Jezza Neumann
2. India: The child sex highway-101 east - Al Jazeera
3. Dictating Virginitv- DW Documentary- Feriel Ben Mahmound.
4. Sex, Slavery, and drugs in Bangladesh- Vice news
5. Stolen innocence India's untold story of human trafficking - Stolen Innocence, Chris Davis
6. Sex trafficking in America- Frontline

#### 1. Overview

##### **Prostitutes of God explores trafficking in India.**

This documentary focuses specifically on the high prevalence of child sex trafficking and its possible religious connections. However, the documentary fails to elaborate on critical elements of Indian society, such as the caste system. Temple prostitutes where the prepubescent girls are dedicated to a goddess and their rest of their lives, they will become sex slaves of the temple. Name of this system is "Devadasi. "In the mediaeval there were glamorous temple dancers and held high social status. They performed sacred religious rituals and danced for loyalty in the name of a goddess called "Yellama". After centuries the link

with the temples and Devadasi demolished. They became the paid mistresses of priests , kings and later rich landowners. Girl children in our society are treated more as a liability in the sense that there is always a cost of marriage. They feel like , they don't have to educate the girl child. They prefer a male child because they believe that they are the liberators of their soul when they die. When comes to poorest families if they get a female child they think that, how they can convert this liability into an asset. The traditional ritual prostitution what we call Devadasi system is one of the coping strategies where they feel that okay, by dedicating their child to goddess and then the girl child will be taken over by one of the landlords.(*Jezza Neumann, 2011*)

### **India: The child sex highway-101 east-**

A highway in the Indian state of Madhya Pradesh is the site of a shocking trade . Girls as young as 10 are being forced to work as prostitute and it's their own families selling them to passing trucks . The girls are from the Bachara tribe , a low caste community known as Dalits. Most of the Bachara men say discrimination stops them from getting jobs , so generations girls have supported their families through prostitution . Menaka's mother forced her into prostitution at the age of 15. She now has a 2 year old daughter of her own, and says she feels trapped. "I feel like I was born in the wrong place, doing the wrong thing. But what can I do? I can't say much because this is our tradition."(*Menaka*). Filming under cover, 101 East discovers girls as young as 10 hours have been offered to men. While India introduced tougher child rape laws in 2018, advocates say the laws are not properly enforced. " The people who are exploiting the child- they are not customers, they are rapists," (*Asheif Shaikh*)- the founder of the local NGO that frees local girls from what he describes as sexual slavery. " This practice is like the serial rape of the children..... They are raped about 10-12 times a day." Madhya Pradesh has the highest number of reported child rape cases of any state in the nation. In this exclusive investigation, 101 East exposes the Indian villages where parents sell their daughters for sex. (*Al Jazeera, 2020*)

### **Dictating Virginty**

In many parts of the world, questions surrounding virginty have seemed to be on the verge of disappearing. But despite the sexual revolution, the idea of preserving virginty has seen a resurgence of late. The film looks at growing movements promoting abstinence until marriage in the United States and Europe. As more and more women choose to join such movements, those in other places often have no choice. In Maghreb, for example, women

must yield to tests to inspect their virginity. The pressure to be able to demonstrate virginity is so great that each year, a number of women resort to operations such as hymenoplasty, to reconstruct the hymen, which can be ruptured in any number of non-sexual ways. Despite all of this obsessive interest, the film shows that, physiologically, virginity does not exist. So what does it stand for, in our contemporary world? DW Documentary gives you knowledge beyond the headlines. Watch top documentaries from German broadcasters and international production companies. Meet intriguing people, travel to distant lands, get a look behind the complexities of daily life and build a deeper understanding of current affairs and global events. Subscribe and explore the world around you with DW Documentary. (*Feriel Ben Mahmoud, 2021*)

### **Sex, Slavery, and Drugs in Bangladesh**

Bangladesh is one of the most densely populated countries on earth with widespread poverty and inequality. In Bangladesh prostitution is legal but completely unregulated. The country's largest brothel is called Daulatdia and it's owned by one of the country's most powerful and influential families. The brothel is the size of a small town and it's conveniently located close to one of the main railway stations. This ensures thousands of customers for the over 2,000 sex workers and sex slaves that sell their bodies there every day. The women that live and work in Daulatdia were either lured there by the promise of work, sold by a family member, or kidnapped and sold as a slave. A beautiful girl can be sold for between \$250 to \$385. The brokers, or the men in charge of finding girls, lay wait them outside of the garment factories where they work or outside the shrines. The place is filthy and obviously unsanitary. There's garbage and human waste running through its narrow alleys. It's estimated that half of the sex workers at Daulatdia are under the age of 18, some as young as ten. Bangladesh is one of the few Muslim nation where prostitution is legal but completely unregulated this latwia the largest brothel in Bangladesh the Lodi is home of more than 2000 sex worker many of them are the victims of sexual slavery .The size of small town Doladwocese between a motor railway station and a ferry terminal it's location ensure a booming trade with thousands of customers passing through the streets every day. One young woman describes her experience of being beaten and bitten by some of her customers. Once she was even forced to have sex with ten to twelve men at the same time. She has been living there for close to four years and must remain until she finishes paying off her debt. Due to the fact that in Bangladesh a fuller body is more desirable, the women are given steroids and told that they are medicine. This allows madames to make under aged girls look over eighteen. These steroids are what

farmers commonly use to fatten their calves. They are highly addictive and cause many side effects such as diabetes and kidney failure. (*Vice news*, 2009)

### **Stolen innocence India's untold story of human trafficking**

Stolen Innocence delves into a hidden world the untold story of young women captured and forced into a life of sex slavery. Without a choice these girls are violently trafficked into the world's largest sex ring. This groundbreaking 90 minute documentary uncovers worlds fastest growing criminal activity. " This film takes an honest look at India, a country known for its peaceful spirituality and traditional values " But there's a dark secret covered up and hidden from the world. Girls are disappearing and being forced into the sex trade every 4 mints. ' This film tackles the issue directly traveling uncovered to location's in India and Nepal infiltrating human trafficking gang's to understand it's deepest secrets and why its growing so quickly nu interrupted by the police or the government and the factors behind the rapid growth of the trade'. (*Chris Davis, 2020*)

### **Sex trafficking in America**

The document, sex trafficking in America is an award-winning directed by Jezza Neumann, this is being filmed in Phoenix. It talks about how women face human trafficking and wish to be normal people. They confront that they may not move forward with their life and family. There are 27 % victims in this documentary. In this case, men utilize women or girls to sell their bodies and get profit. About how they face the situation when they feel dragged or guilty for themselves. They were sexually assaulted and choked for not doing the job. The author explains how she struggles to face her family as well as how she can fight this human trafficking. This was performed on May 28, 2019. Sex trafficking is a huge problem around the world. They were typically teenagers who came to go forward with the vows and victims because of their vulnerability. Sex trafficking of women is being taken for selling homes at the day in and out, making money from human trafficking. Without customers, there are no pimps. They try to rebuild their lives from being dragged. They influence life and are being deduced life a prostitute. Women are being left alone in the street for hours. Prostitutes, therefore, are named after victims or survivors. (*Frontline, 2021*)

## **2. Analysis and Interpretation**

### **Life Satisfaction**

Some of them are not at all happy because one of the women said that “ so many men are coming to us and having their fun but no one loves us ,it is a horrible situation. We are not alive, it's only a body without a soul. We also have the intention to live like the people who lead their life in society”. They feel dragged or guilty for themselves. They came into this field because of their various situations but this led them to not only hate this job but also their own life. They work hard day and night and get paid very less. They cannot complain to anyone because at the end they are always the victims. They themselves consider this job as a curse. They have no one to support them or fight for their justice. Thus they have to always suffer and adjust to the brutal lifestyle. Forced sex, too many clients a day etc leads to various physical diseases starting from the basic fatigue, tiredness to serious diseases like Aids, internal organ failure etc. Even with these serious diseases they have no one to take care of them. They are always banned from their homes and societies and thus they are homeless. A climate of impunity for crimes against sex workers that may lead them to be the targets of violence or of other crimes that may turn violent, such as theft. (*Vaishnavi Dandotikar, 2021*)

### **Personal Life**

When they came across sex trafficking they were worried how they will face their family as they have been dragged to this condition. They confront that they may not move forward with their life and family.. They had to face lot of issues because, in the old ages, it is believed that- “ If you’re a virgin- you have a higher status than women who are sexually active”. “Women are like glass, when she falls, she breaks, you can repair the glass, but it won't be pretty anymore. You’ll see the cracks. Nobody will want to look at it. A pretty glass will always be preferable; a glass that's unbroken intact” .-(*Sana Derouiche, 2021*). reported that, overall, sex work affected their personal romantic relationships in predominantly negative ways, mainly relating to issues stemming from lying, trust, guilt and jealousy. A small number of women reported positive impacts from sex work including improved sexual self-esteem and confidence. Greater public awareness and education programs aimed at addressing the negative stigma associated with the sex industry may go some way towards easing the issues faced by women in their personal relationships.(*Clare Bellhouse,2015*)

### **Economic Background**

One becomes Devadasi for their living. Economic background is the major reason for this practice. Through this job there are many women who have succeeded in their lives. Building

a nice house, a shiny display of cabinets of unused crockery line walls is the testament of their success. Poverty is a major reason given for entry into sex work in India. Most of them come to this field to achieve the basic needs and to live in a better living conditions. Poverty is one of the main causes which push woman towards prostitution. Economically depressed woman with low education level become victims of prostitution. There are other social factors which are responsible for the degradation of woman status. One factor is that view of people about women as commodities. An illegal woman trafficking is another one reason behind the prostitution in India. Girls those are refuse for the sex are inhumanly treated and raped and push them in to this business. Prostitute is the community where government needs to give attention for their rehabilitation. But the government's attitude towards rehabilitation is very poor. Old Tradition like Devadasi is one reason which pushes lot of women into the prostitution. (Umesh Gadekar, 2015). Sex work in India, as in the rest of the world, employs a large number of people who operate on the fringes of legality. It is difficult to know how many sex workers there are in India, but it is estimated that about 1% of adult women in India could be engaged in sex work (Dandona et al. 2006). The majority of women enter the profession involuntarily, most being forced into it either because of poverty, abandonment or violence by husbands, or other family problems (Slegtholme and Sinha, 1996). They are usually contractually obligated, in a form of bonded labour, to work in a brothel under the ownership of a madam or pimp. However, a growing number of newer sex workers are entering sex work relatively voluntarily (Kotiswaran, 2008)

### **Medical Condition**

Mumbai and Kolkata (Calcutta) have the country's largest brothel based sex industry, with over 100,000 sex workers in Mumbai. It is estimated that HIV among prostitutes have largely fallen, in last decade. A positive outcome of a prevention programme among prostitutes can be found in Sonagachi, a red-light district in Kolkata. The education programme targeted about 5,000 female prostitutes. A team of two peer workers carried out outreach activities including education, condom promotion and follow-up of STI cases. When the project was launched in 1992, 27% of sex workers reported condom use. By 1995 this had risen to 82%, and in 2001 it was 86%. Reaching women who are working in brothels has proven to be quite difficult due to the sheltered and secluded nature of the work, where pimps, Mashis, and brothel-keepers often control access to the women and prevent their access to education, resulting in a low to modest literacy rate for many sex workers.

Not only HIV but other infection diseases have been decreased, examined data from 868 prevention projects—serving about 500,000 female sex workers—implemented between 1995 and 2008. The research found that reaching sex workers through prevention programs decreased HIV and syphilis infection rates among young pregnant women tested routinely at government prenatal health clinics. (*Susan Crebbin, 2015*)

In old ages, devadasis tradition is destroying families and communities generation after generation and with the advent of AIDS and HIV, the practice now has a deadly price tag. The literature on sex work demonstrates a clear relationship with a number of health risks like STI's and HIV. Mentally and physically they're exhausted. One of the most popular drugs is yaba, a highly addictive mixture of methamphetamines and cocaine. And Due to the fact that for most of the men, a fuller body is more desirable, the women are given steroids and told that they are medicine. This allows madames to make under aged girls look over eighteen. These steroids are what farmers commonly use to fatten their calves. They are highly addictive and cause many side effects such as diabetes and kidney failure and can even lead to death. These risks are ignored by madam. They may want to protect themselves by using condoms and other safer sex practices, but the men who pay them can make this difficult. The clients may even become violent, if they refuses unsafe sex practices.

### **Prejudices**

These people were sexually assaulted and choked for not doing the job. They describe their experience of being beaten and bitten by some of the customers. They were even forced to have sex with ten to twelve men at the same time. sex work was treated as a negative quality in a parent rather than a aspect of their life warranting further factual exploration. Stigma against sex workers appears to carry more weight in custody and access disputes than evidence concerning the impact that a parents engagement in sex work has on their children . The main challenge sex workers faced included health problems , violence , lack of education and many more. Stigma manifests in policy and regulatory frameworks that criminalise or licence sex work, require sex workers to have mandatory medical testing or permanent registration on police or government databases, prohibit sex work from being visible from churches and hospitals, and local council policies that treat brothels as “outlaws”. Stigma puts sex workers at risk. Criminal and licensing laws create opportunities for violence where sex workers have to choose between safety and legality. Mere knowledge of someone's sex work can be used against them by abusive partners, as blackmail or suggesting they are unfit parents in custody cases. Stigma is socially isolating. It reduces the options for sex

workers to turn to for support and is recognised as a critical barrier to accessing health care, human rights, and justice. (*Zahra Zsuzsanna Stardust, 2017*)

### **Conclusion**

We now prove that sex workers experience a lot of struggles such as employment, financial, family background crisis, violence, health care services, etc. From this, we can understand that they need protection and a good life for themselves as well as from their family. As sex workers, they fulfill doing their job. They do this so that they can fulfil their children with education and special needs. The majority of women think that doing this kind of job makes them flexible and enjoyable. As we come to understand different prostitutes have different life experiences in sex work, we conclude that everyone needs protection and health safety measures. Almost everyone has the same life struggles as a sex worker.

### **3. Theoretical Framework**

Theoretical explanations of sexual exploitation and sex work are rich and diverse at the societal level yet sparse and underdeveloped at the individual level. The contentious theoretical and moral debates among macro-level perspectives not only influence other macro systems (e.g., law) but even determine whether a woman may ever choose to exchange sex for financial compensation.

#### **Macro Theories of Causation at Structural Level**

The bulk of theoretical progress and academic writing is grounded in macro theories to explain the causation of sexual exploitation and sex work at the structural level. Some theories, such as feminism, may appear all encompassing by general name and yet hold stark divisions that greatly impact the understanding of sexual exploitation and the view of what some refer to as its victims. The debates among neo-abolitionist perspectives are continuously active and rarely come to consensus. Influenced by this debate, structural theories lend themselves to divisive legal perspectives, such as criminal treatment of those who purchase or sell sex, as well as those who exploit or facilitate others into performing sex acts for money. Structural theories also explain the financial aspects of sexual exploitation within a larger political context, further politicizing and polarizing working frameworks. Thus, a review of these perspectives is imperative to understanding the national context and debate of sexual exploitation and sex work. (*J Sociol Soc Welf.* 2015 Dec)

#### **Feminist Theories**

Most of the theoretical frameworks regarding violence against women are derived from feminist theories. Feminist theory is a broad, transdisciplinary perspective that strives to understand roles, experiences, and values of individuals on the basis of gender (*Miriam, 2005*). Feminism is most commonly applied to intimate partner violence, framing an abusive relationship between intimate partners as a gender-based crime supporting the institutionalized oppression of women globally (*Nichols, 2013; Sokoloff & Dupont, 2005*). With regard to sexual exploitation, the feminist frame questions whether prostitution or any exchange of sex for something of financial value is or can be voluntary (*Wilson & Butler, 2014*). Feminist theory and its subsequent contrasting divisions also significantly impact service delivery, as direct service providers disagree in the interpretation of the statistical overrepresentation of women and girls seen in practice (*Oakley et al., 2013; Wasco, 2003*)

and research (Clawson, Dutch, Solomon, & Grace, 2009; Farley, Cotton, Lynne, Zumbek, & Spiwak, 2008; Sullivan, 2003). With regard to sexual exploitation or sex work, scholars and advocates are generally divided into two opposing theoretical camps. One group, usually referred to as neo-abolitionists, condemns all forms of voluntary and involuntary prostitution as a form of oppression against women. Neo-abolitionists, including radical and Marxist feminists, postulate that prostitution is never entirely consensual and cannot be regarded as such (Tiefenbrun, 2002). The other group, including many sex positivists, argues that a woman has a right to choose prostitution and other forms of sex work as a form of employment or even as a career. The criticisms and support for legalization, decriminalization and prohibition of prostitution are ongoing and continually divisive in the field. The breadth with which these frameworks guide actions of policymakers, activists, and scholars is extensive, with no end in sight to the debates. Although the bulk of the theoretical work has been and continues to be executed at the macro level, other perspectives have emerged and contribute to the dialogue of sexual exploitation and sex work. Critical Race Feminism

“Critical Race Feminism (CRF) is an embryonic effort in legal academia that emerged at the end of the twentieth century to emphasize the legal concerns of a significant group of people - those who are both women and members of today’s racial/ethnic minorities, as well as disproportionately poor” (Wing, 2003, p. 30). The emergence of the CRF has shifted the dialogue to include women of colour who are constantly being faced with gender and racial oppression that is embedded within the fabrics of society. In the past, several researchers associated CRF with Black Feminist Theory, but as it evolved it expanded to include all women of color, mixed-race feminists, and white feminists who are engaging in critical race analyses (Montoyo, 2006). CRF can allow feminists to move beyond the black and white binary by including those who do not fit on either side of the spectrum. CRF, as proposed by Wing (1997), states that it brings women to the centre of analysis rather than in the background of research. This theoretical framework challenges gender biases and norms, emphasizes the women who are being oppressed in society and allows it to break away from gender and social hierarchies. CRF sheds light on the lives of women who have been ostracized in society based on their race, gender, and class, thereby revealing how all of these factors interact within a patriarchal and oppressive system (Wing, 1997). (Berry, 2010) states that CRF puts emphasis on the issues of power, oppression, and conflict. Women struggle with gender discrimination and oppression at different stages of their lives. Oppression within society Wing (2007) states that international law has completely failed to address and challenge gender discourse within the private realm of family structures. Patriarchy is a

learned belief, and the idea of fostering patriarchy among young boys and enforcing the idea that women are inferior continues to grow within family structures. “Power is subsumed under culture, and oppression is reduced to a symbolic construction in which there are no real live oppressors who benefit materially and no real oppressed people to liberate. In effect, minorities are invited to keep their culture but enjoy no greater access to power and resources” (*Razack, 1994*). Power is constructed within society. Even within Indian society, the justice system consists of males holding power. The notions of patriarchy are for men to dominate in every section of society from the national level of government and all the way to family structures. Within Indian society, power is interwoven into different sections of society, and oppression has been socially constructed over generations, and therefore oppression against marginalized groups such as sex workers has become a normalized aspect in society. On the other hand, for sex workers, the longer they stay within the sex industry, the more dependent they become on the social structures which creates a paradigm where being oppressed is a norm because of the stigma attached to sex workers within the fabric of society. Even when sex workers are being rescued from brothels or from the streets, there is some form of oppression or violence (physical or psychological abuse) that women endure from police officers, staff from rehabilitation centers, or society in general. *Hua (2003)* states that women have been demoralized and painted a negative representation in society. Critical Race Feminism within the Sex Industry CRF will allow this research to use a multi-dimensional and holistic approach that considers analysis from different sections of society that condones and incites oppression of women. “At its most basic level, critical race feminism needs to locate the origins of violence against women beyond the individual pathologies reflected in intimate domestic violence, rape, sexual harassment or other forms of sexual violence, by locating such manifestations in the larger power imbalance between the genders which perpetuate male hegemony” (*West & Bowman, 2019*). Women involved in the sex industry are faced with several barriers that consist of systems of oppression that are partially responsible for misrepresenting women coming out of the sex industry as outsiders. *Crenshaw (1989)* defines the term intersectionality as the antecedence of the concept of an ‘interlocking system of oppression.’ Crenshaw further elaborates that “interlocking systems of oppression can be described as an analogy to a traffic light, where ‘oppression’ or ‘gender discrimination’ can flow not only in one direction but it may flow and overlap one another” It is through the concept of intersectionality that researchers are able to analyze the ‘real world’ problems or realities of women coming out of the sex industry. *Crenshaw (1989)* states that the concept of intersectionality focuses on shedding light on visible experiences of people

who have faced several forms of oppression without disintegrating those experiences through exclusions and identifying the interlocking social structures. It is through these systems of oppression that women are branded a form of identity that represents them a certain way, and it is through these misrepresentations that women coming out of the sex industry are not given equal opportunities or access to resources such as healthcare, education or employment opportunities. *Verjee & Butterwick (2012)* state that CRF places power relations at the centre of the discourse on gender, race, class and all forms of social oppression. They also argue that “anti-essentialist in nature, it involves the examination of the intersections of social oppression and how their combinations play out in various settings”. *Butler (2016)* states that anti-essentialists argue that there is not just one uniform female perspective. Women coming out of the sex industry may have entered it for various reasons. While poverty is the main reason why many women enter the sex industry, there are many other reasons, including being sold into the industry at a young age by family members, or having taken up the trade by choice. Everyone has a different background and therefore there is a need to listen to their stories in order to offer them the best treatment/rehabilitation.

### **Victimization and Entry Perspectives**

While other studies address individual risk factors or common themes of recruitment and initiation experiences (*Cobbina & Oselin, 2011; Kramer & Berg, 2003; Wilson & Butler, 2014*), they are predominantly descriptive and not theoretical or process oriented. A comprehensive search provided very few studies which report the integration or even guided use of theory in understanding the pathway into sexual exploitation or sex work. Although the exceptions to this, four studies in all, are described here, it is important to note that no theory applied to entry into sexual exploitation or sex work was supported or described by more than one author or study. First, *Reid (2012)* applied life course theory to victimization in sex trafficking, which suggests that the impact of any experience, including victimization in this case, is influenced by the person's life stage. Reid found that indicators of harmful informal social control processes during childhood and adolescence in particular were common, creating a desire for acceptance and love commonly exacerbating initial entrapment. The desire for a better life and love, in combination with curiosity about sex work and attraction to fast cash, resulted in a girl's entry into the sex industry. In the second study, *Gwadz and colleagues (Gwadz et al., 2009)* were guided by the theory of social control, emphasizing the role of youths' bonds to conventional society as deterrents to delinquent or deviant behaviour. Without these bonds, *Gwadz and colleagues* hypothesized a

propensity for the initiation of homeless youth into trading sex. Their results showed that social control did play a role in homeless youths' initiation; however, other factors, such as benefits to street economy and barriers to formal economy, also contributed to the initiation. Third, *Whitbeck & Simons (1993)* explored a social learning model of victimization in their study of homeless adolescents and adults. Adolescents in both the model and particular study were more likely to come from abusive family backgrounds and rely on deviant survival strategies such as survival sex. As a result, they were more likely to face criminal justice consequences and experience increased victimization. A fourth study used structural-choice theory of victimization (*Tyler, Whitbeck, Hoyt, Cauce, & Whitbeck, 2004*) to examine the context-specific effects of lifestyles and daily routines on the risk for victimization. Tyler and colleagues used this framework to interpret their study's observed association between survival sex and sexual victimization among homeless youth. The prevalent associations were a result of the choice afforded to them because of low income and lack of other survival options.

### **Exit Perspectives**

Similar to the entry progression, the process by which women and girls exit sexual exploitation or sex work is equally complex and theoretically underdeveloped. Drawing from qualitative analysis and observations of a woman's exit from prostitution, a few studies propose models or stages to exiting prostitution and sexual exploitation (*Baker, Dalla, & Williamson, 2010; Månsson & Hedin, 1999; Sanders, 2007; Williamson & Folaron, 2003*). One theory of exiting prostitution is proposed as empirically testable (*Cimino, 2012*). Few theories exist that explain the existing process and those that do exist are difficult to test quantitatively. This article applies the integrative model of behavioral prediction to examine intentions to exit prostitution through attitudes, norms, and self-efficacy beliefs that underlie a woman's intention to exit prostitution. Constructs unique to prostitution—agency and societal context—enhance the model. This theory may explain and predict an exit from streetlevel prostitution (*Cimino, 2012*), yet no studies have done so to date. The “Phases of the Lifestyle Model” (*Williamson & Folaron, 2003*) targets street-level prostitution only. This process involves phases of disillusionment with the lifestyle of prostitution after violence, drug addiction, arrests, and trauma and then exiting as a result of negative events and attitude changes. The second model, known as the “Breakaway Model” (*Månsson & Hedin, 1999*) includes an experiential tipping point of a negative experience, resulting in the contemplation of an attempt to exit. This model postulates that women are successful in staying away from

prostitution with a change of social networks. Third, Sanders' "Typology of Transitions" (2007) identifies four transitions out of prostitution:

- (1) reactionary transition—women experience a life-changing event sparking their departure;
- 2) gradual transition—women begin to access formal support services slowly, starting their progress;
- (3) natural progression—women develop a natural or intrinsic desire to exit;
- (4) yo-yoing—women drift in and out of prostitution, treatment centers, and the criminal justice system.

Fourth, the "Integrative Model of Exiting" (Baker *et al.*, 2010) draws on stages of change behaviour, when the final exit occurs after numerous attempts are made, resulting in a change of identity, habits, and social networks. Most recently, a predictive theory of intentions combined several theories to estimate the path to exiting (Cimino, 2012). This article applies the integrative model of behavioral prediction to examine intentions to exit prostitution through attitudes, norms, and self-efficacy beliefs that underlie a woman's intention to exit prostitution. This proposed but untested theory assumes that all behaviour is under a person's choice in light of four elements:

- (1) the action (e.g., to exit);
- (2) the target (e.g., the woman);
- (3) the context (e.g., prostitution);
- (4) the time period under which the behavior is to be observed (e.g., permanently).

The surrounding attitudes, norms, the woman's self-efficacy and intentions, skill, and environment also contribute to her choice. This proposed theory targets voluntary exits only, and does not address any pimp or trafficker-related quandaries.

These are multi-causal factors that force women into the sex industry but also challenge and create barriers for women who want to leave the industry.

1. The Multi-Causal Factors That Lead Women into the Sex Industry To understand the sex industry, there several factors that affect how women are coerced into it. These multi-causal factors include discussions regarding victims of a patriarchal system, gender and hierarchy system in India, women's social poverty and the anomaly of women's education in India.
2. Victims of a Patriarchal Society India is a patriarchal society where traditional practices play a part in women's vulnerability associated with violence. The Good Practice Guidelines (2019) states that violence against women is a universal problem occurring in every culture. Violence against women is a very complex issue because

women are considered second-class to men (*Panini, 2001*). In many societies, gender violence is due to the patriarchal societies where men impose with impunity male authority and control. This authority and control are sustained by the deep-rooted culture of submission of women (*Gangoli, 2007*). This constant submission of women encourages men to abuse women in society. Sanders and Campbell (*2007*) argue that women in the sex industry commonly lack social and moral approval from society and therefore become highly vulnerable to various forms of violence perpetrated by police officers, clients, pimps and other sex workers. Mohanty (*2000*) argues that women from the global south are labeled as 'powerless,' 'exploited' and 'sexually harassed' among economic, legal and social discourse. The labeling of women can further stigmatize and leave them vulnerable to violence or forced sex, leading to health issues such as urinary tract infections and sexually transmitted diseases including HIV/AIDS. Even worse, violence can lead to death. A report by the WHO indicated that there are 1.3 million people who die each year due to sexual violence (*Williams, 2013*). In a patriarchal society where gender disparities are common, people within the society become accustomed to violence. *Kumar and Vlassoff (1997), Bose (2012), Rammonhan (2004) and Vlassoff (2013)* argue that most of the discrimination against women does not arise from governmental structures of society. Instead, patriarchy and subordination of women are sown into tradition, family structures, and every social part of society. In India, the culture of male domination is embedded into a person from birth. As soon as a child has been born, families prefer male children to female children. Kambhampati and Rajan (*2004*) analyze that within Becker's framework of investing in your future and maximizing utility, they argue that parents will commit to investing in a male child to maximize the wealth of a family. In India, there are more complexities of being female because not only are you a burden on the family, but you are also viewed as property. Panini (*2001*) argues that in some families, they believe that giving birth to a girl child is considered to be a curse to the family. This ideology is rooted in the Hindu religion as well. Vlassoff (*2013*) states that in some Hindu scriptures, "The son is a boat of salvation, a light in the highest heaven. A wife is a comrade but a daughter misery" . When a girl is born, she conforms to her binary roles and is her father's property. When she is a teen, she is sold to another family through the dowry system. When she wants to become a mother, it is her responsibility to produce a boy child for the family, and then when she is a mother, she becomes enslaved through solely caring for the future generation. Even though

many areas of India have progressed, in many rural areas these traditional views unfortunately still exist today. Many women in India are not conscious that they are being victimized or being subordinate to men. This is the way they have been brought up and how generations of women have been raised. Through these traditional views, women are unable to stand up for themselves since they conform to these cultural beliefs that are so deep-rooted in society. Patriarchal interests are guiding women's lives. Families sell their girl children into the sex industry because they receive a large monetary amount to maximize their family's wealth. With this understanding, women in the sex industry who state that they have entered the industry willingly or do not want to leave are suffering from false consciousness or a manipulated reality (Sen, 2003). Once they are sold into the sex trade industry, yet again they are under someone else's control - male pimps or female madams (who have been abused by pimps in their time spent in the brothel). Sex workers, especially in India, who consider themselves free, are controlled and influenced by patriarchal values. Through this manipulation, they are unable to recognize their oppression and suffering (Gangoli, 2007). Additionally, women in the sex industry are unable to find solidarity or a voice within the sex industry because men in this industry have cultivated a culture in which these women become each other's competition, and it's through these narratives, created by men, that women become voiceless and victimized. This oppression and victimization of women in India are further exacerbated when you analyze male privilege dominance within traditional social and religious structures such as the caste and Devadasi systems. Through patriarchal structures, the caste and Devadasi system has allowed men to dictate and further victimize women in society.

3. The Social Poverty of Women Since the caste system is deeply rooted in society and affects women in the lower castes, it is essential to analyze the factors that place these women in such a vulnerable position they are forced to enter into the sex industry. "We look at the lives of the poor and are sure, just as they are, that something is wrong. They are targets of structural violence" (Farmer, 2009). Poverty is not only a significant determinant for women to be coerced into the sex industry in India, but it is also a major catalyst for women to continue to participate and a challenge for them to leave the sex industry. )Vanwesenbeeck (2017) states that an estimated 40% of India's population lives in poverty. This means 40% of the population lacks essential needs such as food, water, education, health care and shelter. Poverty creates

disparities within existing power imbalances between men and women and therefore increases the vulnerability of those marginalized groups such as women. In a patriarchal society such as India, women are a marginalized group that faces constant violence and gender persecution, which is amplified in the social, economic, and political systems. Chattopadhyay & Mckaig (2004) state that poverty is often cited as the root and growth of the sex industry in India. In Indian society, women are poorer than men and this is a major factor in women entering the sex industry. This form of structural violence has forced women into this profession to afford necessities for themselves and their families. In the process, women are labelled as victims or criminals; they become carriers of infectious diseases and are further stigmatized in society. Due to high rates of poverty, women are more easily trafficked from different states in India. "The sex industry is illegal in India. Yet nongovernmental agencies estimate there are two million sex workers, most of them pushed into the trade by crushing poverty. Many are infected with HIV, the virus that causes AIDS" (Lee, 2008). Poverty is an economic barrier that forces young girls living in a patriarchal society to meet the demands of the patriarch. They end up having to drop out of school and join the sex trade to substantiate the family income. Most women entering the trade come from rural parts of India, where unemployment is drastically higher than in the cities. When the women are being bought into the cities for employment reasons, they realize they make more money in the sex industry than working as a maid. "The sex industry provides a larger amount of income for urban areas. In New Delhi alone, \$2 million is the annual profit of the sex and brothel workers" (Dolson, 2014). There are a few cases where women migrate to bigger cities such as Mumbai to work for cheap labour in places such as garment factories or as housemaids. However, within these spaces, the working environment becomes dangerous to the point where women are abused and often raped. Subsequently, many of these women are exploited and then sold into the sex industry. "Clients may refuse to pay for sex if they have to use a condom and use intimidation or violence to force unprotected sex. They may also offer more money for unprotected sex" (Sinah, 2017). The use of intimidation and violence leaves women no option, especially since they need to provide for their families and are in the brothel owners' clutches. Most of these women stay in the sex industry due to the high rates of unemployment. These women receive more money working in the trade than working in an office, as a housemaid, or in a factory. Poverty not only forces women into the sex industry, but their future

offspring fall victim to intergenerational prostitution. Intergenerational prostitution is when parents involved in the sex industry sell their children into the industry. It occurs in every brothel - the younger the girl, the higher the parents' earnings (*Dolson, 2014*). As mentioned above, women in the sex industry tend to justify their need to continue working in the industry because of the financial incentives while working in the trade. Therefore, women grow their families in the industry, and some employ their children because coercing their children is seen as a means to avoid living in complete poverty. The sex industry becomes a hereditary occupation, passed on from generation to generation. As a result, the dynamic of a family changes, where everyone, including the men in the family, becomes involved in the sex industry. The husbands and sons tend to become pimps or agents for their wives or daughters. There have been many scenarios where young girls who have been sold into the sex industry grow up to become madams. One issue with intergenerational prostitution is it has become very normalized; women conform to the idea that they are meant to be trafficked, they are meant to live in poverty and are meant to be marginalized. Families become trapped in the vicious cycle of intergenerational prostitution, leading to poverty issues within society. Most of these generations that are born into the sex industry lose hope in ever having a future. The normalization of working in the sex industry forces people to not choose, and their children are denied access to quality education.

### 3.8 Laws Related to Sex Workers

Even though it is essential to discuss the multi-causal factors that shape the experience of sex workers in India, such as patriarchy, gender, social caste, education and poverty, the analysis on the justice system and laws in India, will further detangle and address how India's constitution further marginalizes and deters sex workers from reintegrating into society. Despite India's constitution having sections about gender equality and women's rights, international human rights, and several international agencies such as the Global Network of Sex Work Projects (which promotes health and human rights) and a plethora of laws to protect women, women's rights in India are still being violated. *Misra et al. (2000)* state that rights violations have sometimes been committed by the very institutions that created the policies to protect women from violence. The legal system in India is plagued with corruption and politicians who drive their own interests instead of protecting citizens. The conflation of the different kinds of abuse, such as rape, prostitution and battering are common problems that government legislation is unable to protect women from (*Huda, 2006*). Due to the poor

implementations of laws, there are several overlapping groups from lower castes, tribal population, HIV/AIDS infected, disabled people and sex workers who are unfortunately not protected and do not receive benefits such as education, health, or other indicators and aspects of freedom. Even though Prostitution is legal in India, there are several limitations and restrictions that question whether prostitution is legal in India. Nanjunda et. al (2020) state that prostitution in India is legal but other acts such as pimping, running brothels or forcing people into the sex industry are illegal. The ITPA states that prostitution is permitted, it is not permitted in public places. Therefore, prostitution is only legal in the private sector. The most recent amendment took place in 1986, it stated that sex workers may be criminalized for providing services in exchange for money. When analyzing the ITPA law, it portrays this picture that prostitution is illegal. This issue lies with how India's sex industry is formed, women are considered victims because there is an element of them being forced into the industry. Other Feminists and researchers such as Nanjunda et. al (2020) argue that sex work can be a good and rational option for women, when it comes to the case study of India, it makes it difficult to completely decriminalize sex workers. The component of exploitation is embedded into the sex industry in India making it very difficult to support and protect sex workers. The majority of sex workers are forced into the profession when they are minors; often, they are manipulated or do not give their consent, thereby becoming vulnerable to sexual violence and economic exploitation (*Chattopadhyay and McKaig, 2004*). In an article by Swendeman et al. (2009), Veshya Anyay Mikti Parishas sex workers collectively stated that among 300 brothels in the state of Maharashtra, India, nearly half of the women entered the profession at the age of 16 and under, and around one-tenth had entered at the age of 13 years old or less. Due to gender biases, generalization, and poor implementation of laws, governments have failed to punish traffickers, pimps, and agents who solicit children, young girls and women into the sex industry. The position of sex workers as victims or delinquent remains unaddressed and unchanged within the justice system in India. Even though the principle of gender equality is engrained into the Indian Constitutions and further invests in the state to adopt measures to empower women, this does not trickle down to the rural areas, and it is not further implemented amongst women in the sex industry due to the fact they are stigmatized within society. Loomba and Lukose (2012) state that women who are poor or labelled as deviant or immoral are constantly being ignored and neglected

from the democratic boundaries of the judicial system. Many women who live in the rural parts of India, women who are not considered citizens, and women who work in the sex industry are considered even further marginalized. Women who do not fit into an image of family and marriage values which have been created by societal standards have less access to change the democratic system and exercise their rights as citizens. Police Brutality against Sex Workers Police enforcement wields immense power and authority over sex workers, particularly when sex workers are criminalized, but since this is a systemic issue, it stems from the policies, laws and practices that are implemented within society. Police repressions of sex workers are complex as they exploit their power which inculcates this culture of fear. This culture of fear allows for sex workers to fall through the cracks of the health care system and other social safety nets, making them further susceptible to violence, stigmatization and isolation. Law enforcement agencies misconstrue the ITPA and instead criminalize sex workers instead of traffickers. Therefore, sex workers are forced to pay heavy fines to the court system and their lawyers, and some are unfortunately imprisoned (*Jayasree, 2004*). The authoritarian tyrannies allow for individuals such as police officers, lawyers and judges to misinterpret the ITPA and therefore criminalize sex workers instead of traffickers, pimps or clients. Police enforcement in India is full of corruption and fueled by bribes and deception. Minority groups such as sex workers fall into the clutches of police officers in India, especially when there is a stigma attached to them. Many sex workers endure constant name-calling and humiliation, including at times being stripped or beaten in public. In a 2004 study by Jayasree it was noted that the majority (90%) of individuals arrested in brothels under the ITPA were women sex workers, while only 10% were brothel owners, pimps and clients who were also technically breaking the law. In many areas in India, police officers often fabricate evidence against these women. The majority of these women are unable to post bail for themselves, and therefore are under the mercy of law enforcement agencies. These women endure tremendous amounts of violence while being arrested and while detained in police stations. The majority of these women are raped and beaten. Decker et al. (2014) state through extorting fines and information, police officers abuse their power; this often occurs under threats of arrest, physical violence, and gang rape. Despite regular, even daily, police raids, deaths within brothels often go unresolved or undetected.

# CHAPTER 3

## METHODOLOGY

This chapter provides an overview of the strategies used by the researcher to conduct the research. The chapter consists of research design, research setting, tools for data collection and data collection procedures. Important key terms and limitations are also included in this chapter.

### 1. Operational definitions

#### **Prostitute :**

In this study, the prostitute is being referred to a person, in particular a woman, who engages in sexual activity for payment.

#### **Social Taboos:**

In this study, social taboos are being referred to as strong prohibitions relating to any area of human activity or custom that is sacred based on moral judgement.

#### **Patriarchal Oppression:**

A system of social structures and practices, in which men govern.

#### **Feminism:**

belief in advocacy of the political, economic, and social equality of the sexes expresses especially through organized activity on behalf of women's rights and interests.

**Victimization:** The action of making somebody suffer unfairly because you do not like them, their opinion, or something that they have done.

### 2. Research design

The study covers the state of Kerala. The study is a mix of both primary as well as secondary data. This research focuses on the life of prostitutes in Kerala using the reception of the autobiography ' ORU LYMGIKATHOZHILALIYUDE ATMAKATHA ' by Nalini Jameela and Madhu Eravankara's 'PUNARAKHYANAM' documentary. To validate and substantiate the findings from the literature review, primary data collection was done. The field survey was done on a sample basis across Perumbavoor Kerala. Various types of secondary data including studies, reports, journals, articles, Nalini Jameela's autobiography, data collected by the government and non-government organizations are used for the study. The choice of qualitative methods is influenced by the focus of this research, which seeks to examine the

experiences of female sex workers in Kerala. A qualitative method is the best fit for this research because it does not focus on numbers but forces researchers to analyze the words that are being used within the data collection process. This method unravels the thoughts, behaviours, opinions, emotions and ideas of participants. With this research, qualitative methods will allow the researcher to conduct a deep dive analysis on the experiences of sex workers in Kerala.

### **3. Universe and sampling**

The samples are collected from female sex workers, who now work as the waste collectors of government's 'Haritha Keralam Project'. In the study, the researchers used snowball sampling. The data was collected in February. Women who provided verbal consent were interviewed.

### **4. Sources of data collection**

The data collection was predominantly done with 2 major sources : Primary data collection and Secondary Data collection. The primary data are collected from the book (ORU LYMGIKATHOZHILALIYUDE ATMAKATHA' by Nalini Jameela ) and a documentary (Madhu Eravankara's 'PUNARAKHYANAM' documentary). Along with that, data is also collected from the respondents using the interview guide. The secondary data is collected from journals, books, newspapers, e books etc.

### **5. Tools for data collection**

#### **Interview guide:**

The interview guide is an important tool used for this research for acquiring rich and in depth data on the topic under study. The interview guide consists of 25 questions which are curated on the basis of the objectives of the research under study. The interview guide is devised to understand the life of the prostitutes from different dimensions. The interview guide starts with questions that cover their socio- demographic details followed by asking questions concerning the problems they face, protests, fights, how they survive against social taboos.

### **6. Data Analysis**

The book, documentary and the collected data from the field are analysed in the form of interview transcriptions whereby the patterns and categories are identified. The patterns are

termed to be the descriptive findings while the categories are termed to be sub themes or topical forms, meant to interpret the meaning of the pattern. With these steps, the researchers will be able to identify and recognize the major themes, categories and common patterns from the interview transcriptions. Each interview will be transcribed as different case studies whereby a detailed coding procedure will be done using 2 major steps: Open coding and Focused coding. Open coding focuses on finding the initial patterns and categories from the transcribed data. This process focuses on heavily scrutinising, comparing, reviewing different patterns and categories from the data. This will be followed by focused coding whereby the final core categories and themes can be identified from the existing themes and sub categories. .

## **7. Limitations**

This research, however, is subject to several limitations. This research has faced the problem of having limited access to the respondents. Due to this reason, the researchers had to redesign or restructure the research in a different way. This topic is a vast subject which needs more time and effort. Therefore, time constraints have negatively impacted this research. This paper is developed by seven researchers and this might hold biased views due to the cultural backgrounds or perspective of certain phenomena and this effect the study's legitimacy.

## **CHAPTER 4**

### **DATA ANALYSIS**

The book, documentary and the collected data from the field are analysed in the form of interview transcriptions. The goal of this analysis is to identify themes or patterns in the data that are essential to addressing the research questions and objectives. It is through this analysis researchers are able to produce trustworthy and insightful findings amongst a group of participants that are marginalized and stigmatized within society. This analysis provides a flexible approach for researchers to modify the data to provide a rich and detailed data set that compliments the research study. Once all the interviews were complete, interviews were transcribed verbatim for each participant. Once the transcribing process was complete, the transcripts were read rigorously to consider identifying the several meanings in the raw data. Significant themes were identified related to the research question and objectives, including sub-headings for each of the themes which arose from the research question and objectives. Interview transcripts were read by the researcher and responses specific to each sub-theme were highlighted. Theme is a pattern that is retrieved in the data; at minimum, it describes and organizes possible observations, and at the maximum level, it interprets the characteristics of a phenomenon ( *Boyatzis 1998*).

#### **ORU LYMGIKATHOZHILALIYUDE ATMAKATHA' by Nalini Jameela**

Nalini Jameela is a well known sex worker and writer in Kerala. She was born on August 18 1954 in Kallur village Thrissur. At the age of 24 she started working as a sex worker. Nalini's autobiography of a sex worker caused a great stir in the society. This book is written with the help of social activist I Gopinath. Jameela's autobiography published in 2005 caused a great deal of controversy and controversy in Kerala. In 2008 This autobiography was republished. This love book is a literary struggle for the rights of sex workers for women's freedom. Nalini Jameela is a woman who has the courage to say out loud that I am a sex worker in the face of a society that is generally disgusted and disgusted when it is heard that I am a sex worker. Through this book, Nalini call out to the society for every sex workers that they do not deserve any of the disgust and neglect that society pours out and that they also have sacred human feelings such as love and friendship. Nalini Jameela, who is the coordinator of the Kerala Sex Workers' Forum lays out an interesting and powerful narration of the

patriarchal oppression faced by women through her own experience. “I am 51 years old. And I would like to continue to be a sex worker” (*Jameela*, 2005). This is how the candid and defiant opening statement in Nalini Jameela’s autobiography. This throws a challenge at society’s double standards. She wants to regain her ‘loss of identity’ and to represent her-self in this present society. The word ‘self’ is rather a conflict term in the current critical and theoretical space. The idea of self has always captivated a prime position in literary creations (*Ratan Das*, 2018). Nalini says: “When I made film, people said a sex worker made a film. When I make a public speech, when I write a book, people used to say a sex worker did it. I dismiss this attempt to define me only as a sex worker. Hence I tried to throw their phrases back at them” (*Jameela*, 2005). Nalini’s story starts with the descriptions of her childhood when she started learning the lessons of survival and offers a candid picture of street sex workers; their exploitation as well as their pleasures and excitements in life. Born to a humble family she was denied education at the age of nine. Circumstances forced her to work in a clay mine as a daily wage labourer to earn a livelihood. Since Nalini belonged to a lower caste, she was abused and ill-treated there. Nalini’s journey to sex work had its origin in her brother’s marriage; he wanted to marry a girl three years older than him and she supported his decision. So, Nalini was thrown out of the house. At the age of eighteen, with nowhere to go she entered into an accidental marriage with a drunkard called Subhramanyan. But Nalini writes: “He had all sorts of shady dealings. He was womanizing and heavy drinking. He’d go to the sand mines; but his main work was distilling hooch” (*Jameela*, 2005). He died of cancer after three-and-a-half years of marriage and left a son and daughter for her to bring up. The boy died at the age of 17. Without money, and with a daughter in tow, Nalini decided to peddle sex. When a sex worker openly dignifies her profession and compares it with other services like teaching, it is no wonder that cultural pillars are shaken. That Nalini says that she wants to continue to live her life as a sex worker is, of course, a blow to the Malayali who holds dear the family mantra and firmly believes in a patriarchal family structure dominated by the “man of the house” and where the wife is ruled by her husband. Kerala stands at the very top of the literacy ladder, but it is also a place where you wake up each morning to the news of sex scandals, child abuse and sex tourism. That Nalini Jameela who talks about wives being “woman has to safeguard her chastity”. Girls from childhood are told an old proverb, roughly translated as, “If a leaf falls on a thorn or a thorn falls on a leaf, it is only the leaf that suffers”. In Nalini’s home, her mother had no power despite the fact that the house was run with her earnings as a mill worker. Nalini’s father’s pension was insufficient for meeting his many diversions. Outside home he was a communist, but inside no less than a

dictator. When her mother lost her job, Nalini had to discontinue school in the third standard and began to work in a sand quarry. At the quarry, female workers were regularly sexually harassed. It was a part of the women workers' duty to "satisfy" the needs of owners and contractors. The quarry was also where girls and young women often had brief infatuations. The conflict at the global level between feminists and sex workers is reflected in Kerala too. Feminist groups extend their support to sex workers but only up to a limit. They accept the fundamental rights of sex workers, but their rehabilitation policy is unacceptable to the sex workers. Nalini Jameela too is against rehabilitation. According to her, no rehabilitation policy has been successful. "The sex workers who come to this field on their own do not need any rehabilitation, because they have a job. They work with their body, just as some people work with their hands, others with their heads"(Jameela, 2005). A variety of people approached Nalini – politicians, policemen, cultural activists and others. Her path was rough and risky, unimaginable for an ordinary woman. She faced police harassment, encountered local goondas, escaped from a gang rape attempt and even death. Coming to her life as a sex worker, Nalini talked about her encounters spanning a career of 25 years. Her first client was a policeman who also arrested her the very next day, after sleeping with her. This shows the hypocrisy of the world, everyone has sexual needs desires irrespective of gender, class, religion etc. and it doesn't matter whether you are straight, gay, lesbian, bisexual or transgender. Nalini Jameela says that men in Kerala are especially sexually frustrated and to maintain the "good man" repute, would come to her secretly. She says to have met many clients who were sexually, physically and verbally abusive and witnessed many men being especially sexually aggressive towards underage girls. She was especially hurt when some of her clients asked her when she was introducing her daughter into this line of work. Nalini also discussed how many times people have approached her for only talking, having a company to spend time with, or even taking advice. Nalini observed a class-specific behaviour among her clients. If they belonged to the lower middle-class, the assumption was that they would be mild in their approach. Men from the middle class wanted value for money and men from the upper class were mostly a bit harsh and rude. The pay you get also depends upon the standard of the area you are at when you are approached. With these things she makes sex a commodity to be sold, referring to it as normal as selling any other product. Nalini has, therefore, been fighting to make sex work legal. Nalini Jameela says that most of the sex workers got into the profession accidentally while they were fleeing sexual abuse, when 'lovers' cheated them by selling them off to pimps or when pimps pretended to be job agents from big cities. In the interview, Nalini says getting out of the profession is difficult

because the stigma attached is so entrenched that the workers cannot find jobs or even a house for rent without being exploited when not shunned.

Jameela's entry into the public was through the organizing of sex workers NGOs, as part of AIDS Prevention campaigns. Nalini, a representative of sex workers, represents how they serve the society in another way to satisfy the conjugal life of men. The power of the author's language lies in the fact that it has become the simplest weapon to crush attempts to suppress and cover up. The beauty of that language is that it creates the conditions for the minds of many generations to think about right and wrong, beyond the body that may perish tomorrow. Feel that the book, which was chosen with the intention of testing one's own point of view by reading the forbidden revelations, ends with a blow to hypocrisy, a picture beyond prejudice.

### **'PUNARAKHYANAM' documentary- by Madhu Eravankara**

Madhu Eravankara is a film director, film critic, film scholar, film jury, film teacher, and author. He was born in Eravankara in Alappuzha District, Kerala, India. The documentary was created with the help of the 'SWARUMA' self help group, Perumabavoor. Madam, Shafeena was the light and soul 'SWARUMA'. The documentary witness the past life of seven sex workers (Mary Pailee, Khadeeja, Sudha K G, Aleyamma Ouseph, Leela, Reena, and Aswathy). The organization Resource Center for Training and Counseling (RCTC) was mainly working on training, empowerment and counselling at places including- Moovattupuzha, Koothattukulam, and Kothamangalam.

Implementation of sexual health programme of the AIDS control society was top on RCTC's agenda. The main thrust was on prevention of AIDS. Taking into account their interest and motivation, Moovattupuzha municipality came forward to take them into the fold of 'Kudumbasree'. In due course sex workers were brought to RCTC for counselling. They gave them an opportunity to ventilate their feelings without any inhibition. Moreover they were given training in sex health program and thus became peer educators. Then they made them into a group named SWARUMA comprising 10 members. Hurdles were many, the empowerment of a sex worker aimed at not only maintaining their sexual health but also to ensure their social recognition as well as meeting their day to day needs. A steering committee was formed consisting of Municipal chairman, vice – chairman, health standing committee chairman, police officers, hospital authorities, media persons, staff of RCTC and two representatives of sex workers. In the discussion followed some of the sex workers expressed their desire to quit their profession and merge with the mainstream provided they

were given employment. Taking into account their interest and motivation. Muvattupuzha municipality came forward to take them in the form of – kudumbasree . Naturally it was very difficult to enlist the sex workers as members of kudmbasree as they lacked residence within the municipal limit. To facilitate their rehabilitation T.K Jose IAS , the director of kudumbasree and kabeer , then the district co – coordinator , and the municipal council together took initiative in providing the advance of Rs. 50,000 from kudumbasree and arranging a bank loan of Rs. 50,000 to set up a laundry unit in the taluk hospital. Madhu Eravankara's, documentary Punarakhayanam, speaks about the agonies and despair that they have faced throughout their job. Mainly their issue was abuse and getting beaten up by clients. “At nights when I came waiting for clients near the bus stand or cinema theatre, policemen on patrol treated me brutally”(Aleyamma, 8.00). They also faced other issues like ; scarce income, two or more people, police officers disturbance at night, brutally beaten, pimps, AIDS, health issues, and lack of residence. They felt they might lose their hope in their family and children. When they had critical days they felt an impression that they might lose themselves forever. Every sex worker's ambition is to educate their children and should not have the same fate. Sex workers came into this industry for the fulfillment to educate their children as well as to survive with basic amenities like; food. Every sex worker has left their homes due to family issues and being left out without a residence. “I belong to kannur in North Kerala, a bitter experience from my stepfather had thrown me into sex work . When I left home my only wish was to commit suicide . Later on, an afterthought dawned in my mind . Why should I die? Slowly I made acquaintance with many like me and they initiated me into sex work” (Reena, 5.00). Mainly this job occurs when two or more people come across a group of people and they become a fully-fledged sex workers. The protests that were taken from this situation were to go against being a sex worker and get access to other socially based workers. They survived with society by doing their duty by making them proud of what the sex workers can do to uplift the government. They are not satisfied with this job, some of them want to be normal people and get a life of their own. The government created new programs to get them socialized and to be proud of what they could become by doing other jobs. “ I would go to a police station or meet a doctor if my two Children had been married off . I am a happy woman now” (Aleyamma,24.16). Sex workers and their families have spoken of abuse and violence and they have added a human face to these women's lives . They were all beaten up and regular payment was also not given . Sex workers has suffered a lot . Many sex workers got into this job because of poverty and family problems . At night when they are waiting for their clients, the police would beat them

brutally . Now they are given opportunities to ventilate their feelings without any inhibition nad and they were given training in sex health program. The empowerment of a sex worker aimed at not only maintaining their sexual health but also to ensure their day to day needs. Some sex workers had a desire to quit their profession and provide them with a good job. They wanted society to see them as equal as other people. They were very much concerned about their children and wanted them to have a proper atmosphere. At present they are having a decent job and they are given a decent salary which is enough for them to lead a decent life. Even the people who support them are also treated in a bad manner. “When we started working along with them , in the street onlookers often asked us , ' Don’t you have anything else to do? Do you think you can make them normal ? People even equated us with them . But the staff of RCTC dismissed the popular responses . Because we were strengthened with our vision to improve the lot of a few hapless women” (*Shafeena, 20.27*).

Table 1.1: Emerging patterns, categories and themes from the book and the documentary.

<b><u>THEMES</u></b>	<b><u>CATEGORY</u></b>	<b><u>PATTERNS</u></b> <b>(Book)</b>	<b><u>PATTERNS</u></b> <b>(Documentary)</b>
Objectification of women's body	Experiences	<ul style="list-style-type: none"> <li>❖ Bad approach of men</li> <li>❖ Sexual abuse</li> <li>❖ Abuse from family members</li> <li>❖ Society's judgement</li> <li>❖ Police ill-treatment</li> </ul>	<ul style="list-style-type: none"> <li>❖ Mistreatment at workplaces</li> <li>❖ Bad approach of men</li> <li>❖ Society's judgement</li> <li>❖ Sexual abuse</li> <li>❖ Police ill-treatment</li> </ul>
Prejudice against sex workers	Spoiled identities	<ul style="list-style-type: none"> <li>❖ Morally destitute</li> <li>❖ Sex loving</li> <li>❖ Consensual</li> </ul>	<ul style="list-style-type: none"> <li>❖ Sex loving</li> <li>❖ Lacked proper upbringing</li> <li>❖ Have no shame</li> </ul>

		<p>criminals.</p> <ul style="list-style-type: none"> <li>❖ Have no shame</li> <li>❖ Loose and easy women</li> </ul>	<ul style="list-style-type: none"> <li>❖ Loose and easy women</li> </ul>
	Social problems	<ul style="list-style-type: none"> <li>❖ Lack of education</li> <li>❖ Abandonment issues</li> <li>❖ Unfair treatment</li> <li>❖ Societal perceptions</li> <li>❖ Social isolation</li> </ul>	<ul style="list-style-type: none"> <li>❖ Abandonment issues</li> <li>❖ Unfair treatment</li> <li>❖ Lack of education</li> <li>❖ Societal perceptions</li> <li>❖ Social isolation</li> </ul>
	Challenges	<ul style="list-style-type: none"> <li>❖ Police ill-treatment</li> <li>❖ Family problems</li> <li>❖ Several health problems</li> <li>❖ Societies judgement</li> <li>❖ Bad treatment of clients.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Family problems</li> <li>❖ Several health problems</li> <li>❖ Societies judgement</li> <li>❖ Police ill-treatment</li> <li>❖ Treated as Sex object</li> </ul>
Patriarchal society	Hypothetical system	<ul style="list-style-type: none"> <li>❖ Women are considered a disgrace</li> </ul>	<ul style="list-style-type: none"> <li>❖ Women are considered a disgrace</li> </ul>



		<ul style="list-style-type: none"> <li>hours</li> <li>❖ Too many clients</li> <li>❖ Low paid</li> <li>❖ police ill-treatment</li> <li>❖ Health issues</li> <li>❖ Forced sex</li> </ul>	<ul style="list-style-type: none"> <li>❖ Intense working hours</li> <li>❖ Too many clients</li> <li>❖ Low paid</li> <li>❖ police ill-treatment</li> <li>❖ Health issues</li> <li>❖ Forced sex</li> </ul>
Society's Stigmas about sex workers	Challenging stigmas	<ul style="list-style-type: none"> <li>❖ Tags them with titles</li> <li>❖ Considers them a curse</li> <li>❖ Lower's their status</li> <li>❖ Treats them badly, abuses in public places</li> <li>❖ Social injustice</li> </ul>	<ul style="list-style-type: none"> <li>❖ Tags them with titles</li> <li>❖ Considers them a curse</li> <li>❖ Lower's their status</li> <li>❖ Treats them badly, abuses in public places</li> <li>❖ Social injustice</li> </ul>
Medical conditions they suffer	<p>Health issues</p> <p>Accessibility</p>	<ul style="list-style-type: none"> <li>❖ HIV clients</li> <li>❖ Infections</li> <li>❖ Fatigue</li> <li>❖ Getting Tired</li> <li>❖ No proper</li> </ul>	<ul style="list-style-type: none"> <li>❖ HIV clients</li> <li>❖ Infections</li> <li>❖ Fatigue</li> <li>❖ Getting Tired</li> <li>❖ Painful sex</li> </ul>



## **CASE 1:**

Name: P L kadheeja

Age: 50

Place: Kavalangad , Nellimattom, Kerala

“ I used to go for wood work, then I fell in love with a person and had a boy child. Then I met another person who was ready to marry me and had a girl child. The girl child is not staying with me. She lives in Changanassery. She has gone for years and never came back. Then to grow up this boy child I had to face a lot of struggles. My mother died and my father and sisters didn't even look after me. My children and I had to struggle a lot to live a life and that made me feel so sad. After that, another person joined me and we both started to live together. When my girl child was born in the hospital he helped me by giving some money. For two months only we lived together and then he left. Then I went to set up. I got money from the job and with that money I bought rice and food for my family. Then came another person who promised to look after me and my family. He always fights with me and one day he left the house and started to stay somewhere else. He had drinking issues and used drugs like Kanjav. I used to go to work around 6.30 pm and come back home at 8pm. I go to work only after completing the household duties. So, when I get back home, he'll be staying outside the house waiting for me to give him all the money. I wasn't allowed to take any amount from it. Then we both stayed together. Then days later, we got a plot from the panchayat. I still used to go for the set up. I started to go for this job at the age of 18. I fought with my family and decided to leave home. Nobody forced me to stay, if they force me also, I won't listen to them because they don't even care about me , so why should i stay there!. I came into this field by my choice and nobody forced me. A person named Jameela helped me to stay at a house in Vadattupara. Her mom took care of my children and we both went for the set and up. After coming back from the job, we buy things and stuff. That's how I lived. After 4 years, he fell in the well and died and I became alone. Then my son and I tried to build a house and I stayed there alone. My son got married and stayed somewhere else. In 2001, Sabina madam with the support of the municipality helped me to find the present job. I was not satisfied with sex work job. I went for the job only because I want to look after my kids, I never wanted them to starve. Then a person came by saying there is an office job. I still used to go for sex work and also do other works like buying condoms from the shops and giving it to them. I got the payment between 300-600 Rs. Then my salary increased to 3000-5000 depending upon the work. They were different jobs like buying condoms and giving it to the person, we had to talk to other people. If they want to see a doctor, I also have to go

with them, then blood tests etc. By doing these jobs, I got a higher payment. Sabina madam helped me to find a job. Then I worked at a washing unit at the government hospital and I got payment from this job and also from sex work job. My family knew about my sex work job. I don't talk to them nor even visit them. They don't even care about me because they believe i've no shame. My brother and sister won't even check on me, my son is staying somewhere else and I live my life staying alone and that's my life. There are a lot of people who talk bad about me and i've nothing to comment on. They have to understand that nobody supports me and my kids. To live a life I had to forcefully choose this job. I wasn't forced to wear any clothes to attract my clients. If they force me to, I won't listen. If the clients don't get what they want, they get angry and will ask why are you doing this job. Sometimes they even throw stones at me. Nobody hurted my physically. My working time is between 6.30- 8pm. For one day there will be like 3-4 people as clients. They will come and go. The money I got from the job was 25 Rs. There are a lot of people who have infections but i haven't met with any health issues. We always compel our clients to use condoms for safer sex. There was a office for the sex workers where they provided us with jobs, condoms, payment etc. We never had any organisation or community mobilization for sex workers. I don't want this job to be legalized. During those days, police used to attack us. They always come and tell us to go away. They never hurt or beat us. When the client and I have a conversation, the police come and interfere , they will ask so many questions like why are you here. The clients were usually the people who were alcoholic and used drugs. I had a crush on some of my clients. I stayed only at kothamangalam and didn't go out of that place. My son was ashamed of my job. My son is married and has 2 children. I had to face so many issues when I went to shops, they never treated me with respect but now everything changed because I have a job that is accepted by society. I used to have alcohol with my clients but now everything has stopped. Now everyone treats me with respect and I am happy with my present job and life.”

## **CASE 2:**

Name: Mariyam (Reena)

Age: 49

Place: Piravom

“ I came to this field as a sex worker because of a man who I loved and he cheated on me. He was Pretending to love me but later I came to know that he was cheating on me. He took me to the room and we stayed for a day and from the next day onwards, I noticed other men entering the room. He always stays away. Slowly I came to realize that he was selling me for

money. I was 20. No one from my family knows about this. I was staying at Muvattupuzha and now staying at Koothattukulam. I came to this job because of this experience. During the year I used to go home to see my father and mother. They were no one to help us, both mentally and physically. Then I have uncles who go for work but don't have any education. For some years I stayed in Ernakulam to look after a child in Kochi. There were difficulties while I was working in this field. For one day there will be 6 people as clients. Many people asked me if I didn't want to do this, then why did I choose this job. Some of the clients were good but some of them weren't. Due to this job, I had to face many problems from society. I was avoided from many celebrations and also had to hear many blames from others. Many times I thought of committing suicide. After that, I found a man and I stayed with him for many years as we lived together. When I was with him, I didn't go for this job. I got more love and care from him. We bought a house for rent and stayed together. After that we stayed in Pattimattom. We led a happy life. I had 4 brothers. 2 of them were very helpful but the other two had health issues. One person had a mental disability. After many years, my father and mother passed away and my younger brother stayed with me. I got 500 rupees per person for the job. Later it increased to 1000 rupees. Clients were usually police men, and other normal people. Condoms was used for safer sex. Some of them don't like to wear condoms but we forcefully ask them to wear them. They know about HIV but still they refuse to wear it. We sex works had organization but I wasn't part of it. I don't want anyone to choose this job. Some people do it secretly but some of them do this in public due to which they get avoided from many places. I came out of this job and now I'm having a simple and happy life without any problems. I don't want to get married anymore. I have health problems. I'm facing breathing problems. I used to drink alcohol when I was working for that job. Many of them cheated me by stealing money from me. There was this person who regularly visited me and I had a crush on him and I told him about this, but I never got accepted because he's already married and has kids. Now I'm satisfied with my present job.”

### **CASE 3:**

Name: Sudha K G

Age: 58

Place: Pulluvazhi, Perumbavoor

“ I came into this job when I was 30. I had family problems. I was satisfied with the job. I had met with an accident, and that's all. My family didn't know about my job, we don't have









## **Prejudices against sex workers**

### **Social problems**

“ I came to this field as a sex worker because of a man who I loved and he cheated on me” (*Mariam*). In most cases in the life of sex workers it is seen that they go through lot of cheatings. Being very vulnerable in the society where they are treated with injustice most people including their family, husband, lover, their clients etc cheat them either without paying the amount for their work or by taking away all the money they have earned. “ No one supported me financially”(*Sudha K G*). This leads to various financial issues which eventually leads them to poverty. They cannot even meet their basic daily necessities. Most of the sex workers are very less educated as thier patriarchal family considers it less important to educate women and thus they are very less aware about the world outside which makes them the vulnerable category in the society. Society treats them very badly by not giving them food, not allowing them to enter religious places, public parks etc. They are even abandoned from their own family. They are not allowed to attend any family functions and they are considered a curse to their family. This leads to them being homeless. Stigmatization of sex work permeates all facets of society, being understood as a mark of disgrace, a social discrediting, or a spoiled identity. Derogatory terms, such as “prostitutes”, “hookers”, and “whores” are often used to describe sex workers in the media, politics and even research literature. The sex workers considers it better to end their life rather than to live in such a hard living atmosphere. The root of this stigmatization may be due to the manner in which sex work is perceived in the eyes of the law. ‘Whore stigma’ has been conceptualized to shame sex workers – particularly women – who embody unconventional gender norms, such as selling their body for sex, satisfying lust and fantasies, and carrying and transmitting sexually-transmitted diseases. This stigma has engendered a misconception of the sex worker as an uneducated and poor individual, leading to a generally socially-acceptable disrespect and discrimination of these individuals. As such, sex workers come up with strategies to hide their involvement in sex work, as not to experience public shaming by authorities, being banned from home communities or by friends and family, and experiencing abuse of power. In many instances, this stigmatization prevents sex workers from obtaining adequate health services, who must resort to unconventional methods, such as unsanitized clinics or electing to go without treatment.

### **Experiences**

The number of clients each day increases and this leads to a lot of trouble in their physical health. Too many clients and continuous sex causes various diseases.

Diseases like HIV and failure of various internal organs are life threatening. Apart from this the ill treatment of the police is the worst. At certain times policemen who slept with them the previous night beat them very badly the next day. “When the client and I have a conversation, the police come and interfere, they will ask so many questions like why are you here“ (*Kadheeja*). Finding them in places like bus stands, railway stations leads them to be arrested and will be treated brutally by the police. The study found that high levels of forced sex and sexual exploitation were experienced by the majority of the sex workers.

### **Challenges**

The culture among the police, along with the intense social stigma and discrimination against sex workers, embolden the police to unlawfully abuse their powers. They torture women sex workers as a form of punishment and social control. The lack of relief made it particularly difficult for sex workers whose livelihoods are precarious, with no state-sanctioned safety net or family support. Sex workers' families often depend on their daily earnings to run their families, and do not have savings, access to loans and other financial institutions. The lack of regular income had a domino effect on access to other basic necessities, including housing. Because of the work, a sex worker has a greater risk of getting sexually transmitted infections (STIs) and HIV than other women. The risk is increased because sex work means she must have sex with many different men each day. She may want to protect herself by using condoms and other safer sex practices, but the men who pay her can make this difficult. Combined with the present societal outlook on prostitution, they discourage sex workers from actively peddling their occupation and denies them access to mainstream society. This only furthers their already poor conditions. Because society deems women in sex work to be morally corrupt, they are assumed guilty thus “deserving” of any violence committed against them. There are several contexts, dynamics and factors that put sex workers at risk for violence. This may include violence from clients or co-workers. Stigmatization of sex work may lead partners or family members to think it acceptable to use violence to “punish” a woman who has sex with other men. It may be difficult for sex workers to leave an abusive relationship, particularly when perpetrators threaten them, or have control due to ownership of a home, or the power to harm or refuse access to their children. In addition, using objectification to analyze the ethics of sex work assumes that being identified as and with one's body is necessarily degrading. They are treated as a sex object by their clients. Specific

vulnerabilities documented as affecting children of sex workers include: separation from parents, sexual abuse, early sexual debut, introduction to sex work as adolescents, low school enrolment, psychosocial issues arising from witnessing their mothers' sexual interactions with clients, and social marginalization. The study identified a number of ways in which sex work impacts negatively on women's personal romantic relationships. It is found out that sex workers are experiencing dissolution of marriage. The female sex workers displayed high rates of mental disorders. These mental disorders were related to violence and the subjectively perceived burden of sex work which may lead them to have a tendency of committing suicide.. "They were no one to help us, both mentally and physically. Many times I thought of committing suicide" (*Mariam*).

### **Spoiled Identities**

Stigmatization of sex work permeates all facets of society, being understood as a mark of disgrace, a social discrediting, or a spoiled identity. Derogatory terms, such as "prostitutes", "hookers", "whores", "Moraley destitute" and "Consensual criminals" are often used to describe sex workers in the media, politics and even research literature. Without realizing the real situation, prostitution are regarded as people who probably lacked proper upbringing, have no shame; loose and easy women etc.

### **Life satisfaction of sex workers**

#### **Work Satisfaction**

The people who have once come into this field have only hated this profession. They hate this lifestyle of theirs and consider it as a curse in their life. They came into this field because of their various situations but this led them to not only hate this job but also their own life. They work hard day and night and get paid very less. They cannot complain to anyone because at the end they are always the victims. They themselves consider this job as a curse. They have no one to support them or fight for their justice. Thus they have to always suffer and adjust to the brutal lifestyle. Forced sex, too many clients a day etc leads to various physical diseases starting from the basic fatigue, tiredness to serious diseases like Aids, internal organ failure etc. Even with these serious diseases they have no one to take care of them. They are always banned from their homes and societies and thus they are homeless. A climate of impunity for crimes against sex workers that may lead them to be the targets of violence or of other crimes that may turn violent, such as theft. "Many of them cheated me by stealing money from me" (*Mariam*). Poverty, stigma, and social exclusion are all common risks faced by sex workers.

sex workers' in-person services were suspended, posing more financial stressors to an already poverty-stricken population. "I was not satisfied with sex work job. I went for the job only because I want to look after my kids, I never wanted them to starve" (*Kadheeja*). Because of the work, a sex worker has a greater risk of getting sexually transmitted infections (STIs) and HIV than other women. The risk is increased because sex work means she must have sex with many different men each day." My mother died and my father and sisters didn't even look after me" (*Kadheeja*). "I had to face many problems from society. I was avoided from many celebrations and also had to hear many blames from others" (*Mariam*). They were secluded from the family and society. Some of them are ready to accept their past like Nalini Jameela. "I am 51 years old. And I would like to continue to be a sex worker" (*Jameela*, 2005 ).

### **Work Stress**

the number of clients each day increases and this leads to a lot of trouble in their physical health. Too many clients and continuous sex causes various diseases. Apart from this the ill treatment of the police is the worst. Even though they work for very long hours, they're still paid very less. Forced sex, too many clients a day etc leads to various physical diseases starting from the basic fatigue, tiredness to serious diseases like Aids, internal organ failure etc. A climate of impunity for crimes against sex workers that may lead them to be the targets of violence or of other crimes that may turn violent, such as theft. "Many of them cheated me by stealing money from me" (*Mariam*). The study identified a number of ways in which sex work impacts negatively on women's personal romantic relationships. It is found out that sex workers are experiencing dissolution of marriage.

### **Family Support**

The women in most cases suffer and adjust to all issues because then only she can earn. Even after adjusting and suffering all the pain she would be paid very less. But they have no one to seek help. They are basically homeless. No friends and family to support them. The family consider them as a curse. "I had to face many problems from society. I was avoided from many celebrations and also had to hear many blames from others" (*Mariam*). They were secluded from the family.

### **Romance**

Apart from poverty another major issue that leads the women to come into this field is because of either their husbands or their lover. These women trust their partner blindly and leave their homes and family to live with their partner. These partners at most of the time cheat the women and at most of the cases leave them in some places far away from their homes and this leads them to accept some kind of job which at most of the time would be sex work because it requires no education or qualifications. In other cases the wives were sold to other men for money or business growth. "He was Pretending to love me but later I came to know that he was cheating on me. Slowly I came to realize that he was selling me for money" (*Mariam*). This leads them to continue the job because they will not be accepted back into their homes.

### **Medical Conditions they suffer**

#### **Use of contraceptives**

Contraceptives like condoms, diaphragms etc at most of the time are not promoted by the clients. They force them not to use any kinds of contraceptives which might lead them to pregnancy and the client abandons the sex worker. This leads her to leave her job as well as take care of the baby. Most of them are aware of their health conditions. "Condoms was used for safer sex" (*Sudha K G*).

#### **Health issues**

Certain people force the women for sex which might be painful for the women. The women in most cases suffer and adjust to all this because only then can she earn. Even after adjusting and suffering all the pain she would be paid very less. But they have no one to seek help. The clients of sex workers act as a 'bridge population', transmitting HIV between sex workers and the general population. Sex work leads to various physical diseases starting from the basic fatigue, tiredness to serious diseases like Aids, internal organ failure etc. The mental disorders were related to violence and the subjectively perceived burden of sex work which may lead them to have a tendency of committing suicide. "They were no one to help us, both mentally and physically. Many times I thought of committing suicide" (*Mariam*).

#### **Accessibilities**

The health care they receive is also very poor. The society and the health care in charge blame the sex workers for all the physical health problems caused. They always say that the

diseases caused are due to their work and their treatment is always delayed. The medical support received is not sufficient enough to look after their health.

### **Economic Conditions**

#### **Economic satisfaction**

The sex workers are often found homeless or in utter poverty even after long working hours. This is majorly due to their low payment or no payment at all by the clients. The clients often cheat the sex workers without paying them the actual money. If they complain about their situation to the police the officers bully them or treat them badly by either beating them or by charging the cases against them. Due to the status of their job they are not accepted at homes. These people are treated badly by both their families as well as the society. No kind of financial help is provided to them in any kind. Even if she has to take care of a child born from a client no one event the father of the child doesn't care about the women or the kid thus they are abandoned.

#### **Financial support**

The society and the family doesn't care about the well being of these women. The government also do not take any initiatives to raise the living status of the sex workers. Because sex work is not recognized as a “legitimate” profession, sex workers have been unable to access government relief programs in countries where sex work is criminalized. Without financial and social support, sex workers are slipping through the cracks.

### **Objectification of women's body**

#### **Experiences**

Sex work, which in most settings is criminalized. Sex workers are blamed for much of the AIDS epidemic. But who infects the sex workers and often their own wives but men? By blaming sex workers, these men fail to take responsibility for spreading the disease. The clients often cheat the sex workers without paying them the actual money. “Many of them cheated me by stealing money from me” (*Mariam*). The legal status of sex work can be a critical factor in shaping patterns of violence against sex workers. In many settings, the criminalized or quasicriminalized nature of sex work means that violence that occurs in the context of sex work (i.e., as a workplace harm and abuse, Abuse from family) is not monitored by any formal bodies. Combined with the present societal outlook on prostitution, They discourage sex workers from actively peddling their occupation and denies them access

to mainstream society. This only furthers their already poor conditions. Because society deems women in sex work to be morally corrupt, they are assumed guilty thus “deserving” of any violence committed against them. The culture among the police, along with the intense social stigma and discrimination against sex workers, embolden the police to unlawfully abuse their powers. They torture women sex workers as a form punishment and social control.

### **Patriarchy Society**

#### **Hypothetical system**

Men consider women as a disgrace. There is no value for her opinion. The father, who is the dominant person in the family, decides their children's life. They are not provided with any education. This has brought greater restrictions in their future life. Nalini Jameela was such a kind of a person, who loves to study and read books, but her father was against this idea and she was restricted from further education. They are asked to work in fields and mine's factories at their young age itself. They married early. Even after marriage, they have to face a lot of issues from their in-laws who treat them badly.

### **Society's stigmas about sex workers**

#### **Challenging stigmas**

Society considers sex workers as a curse. Without realizing the real situation, prostitution are regarded as people who probably lacked proper upbringing, have no shame; loose and easy women etc. Being very vulnerable in the society where they are treated with injustice most people including their family, husband, lover, their clients etc cheat them either without paying the amount for their work or by taking away all the money they have earned. “No one supported me financially”(Sudha K G). This leads to various financial issues which eventually leads them to poverty. They are not allowed to attend any family functions and they are considered a curse to their family. This leads to them being homeless. sex workers come up with strategies to hide their involvement in sex work, as not to experience public shaming by authorities, being banned from home communities or by friends and family, and experiencing abuse of power. In many instances, this stigmatization prevents sex workers from obtaining adequate health services, who must resort to unconventional methods, such as unsanitized clinics or electing to go without treatment. “I had to face many problems from society. I was avoided from many celebrations and also had to hear many blames from others” (Mariam). They were secluded from the family.

### **Legalization of sex work**

#### **Decriminalizing sex work**

Legalisation of sex work might change the attitude of the society towards the sex workers and also the family accepts the women. She will not be left alone in the streets and would have a better lifestyle as a whole. “The sex workers who come to this field on their own do not need any rehabilitation, because they have a job. They work with their body, just as some people work with their hands, others with their heads”(Jameela, 2005).

## **CHAPTER 5**

### **MAJOR FINDINGS AND CONCLUSION**

## **1.FINDINGS**

### **Introduction**

This study provides valuable information about the life experiences of prostitutes in Kerala. These women's lives at the time of entry into sex work were socioculturally and economically vulnerable as evidenced by the early age of sexual debut, low levels of education, unemployment, absence of protective male partners, poor relationships with families, and drug use. The term curse has been used in different manners, ie: personal perspective, family perspective, society perspective. Most of the sex workers are aware of their health conditions. For these women, engagement in sex work can be construed as a strategy for addressing economic vulnerability, which has been achieved at the cost of increased social (in the form of stigma) and HIV vulnerability. Most of the women knew other female sex workers at the time of entry into sex work, which possibly facilitated entry into sex work and, to some extent, normalized it as a livelihood option. Other indicators of vulnerability in their current lives included high mobility, insecure accommodation, the need to financially support dependents, and the demand to give a portion of their income to others. Between the point of entry into sex work and the present, there was a noticeable move away from living in the homes of families and friends and a greater uptake of rented accommodation. The consequent imperative to earn sufficient income to pay monthly rental, give money to dependants, makes it very difficult for the women to leave sex work when the amount they can earn in a day doing sex work is roughly equivalent to what other unskilled women might earn in a week. Finally, the lives of all women in this study would be improved by strategies to promote their health, ensure their safety, and protect their rights as long as they are engaging in sex work. Most of the women knew other female sex workers at the time of entry into sex work, and presumably these networks expand over time. Such social networks can be mobilized for action. Community mobilization of female sex workers in Kerala has been slow to emerge, but has the potential to protect them not only from infection with STIs, such as HIV, but also from violence, extortion, and community and police harassment. This is likely to benefit not only the female sex workers but also their children, their families, and the wider community.

### **Coercion of Women into the Sex Industry**

There are several multi causal factors that force women into the sex industry in India. During the in-depth interviews, the female sex workers identified that social and economic determinants were the key factors that forced them into the sex industry. The female sex workers who participated in this study were between the ages of 22 – 65 years old. These participants entered the sex industry when they were between the ages 19-40 years old. As soon as the interviews began, most participants dove into the reasons why they were in the positions they are in today.

### **Violence against Female Sex Worker in the Sex Industry**

When vulnerable individuals are coerced into the sex industry, this often damages their mental, emotional and physical well-being. This is aggravated even further when these individuals come from poor social and economic circumstances. While these women are violently being coerced into the sex industry, the violence continues to intensify among the pimps, madams and clients. Female sex workers are continually raped. This form of violence can break down a woman's identity and affect not only their physical health but also their mental health. The violent and abusive reality of sex workers in the sex industry comes with, as has been shown, an additional level of threat to life. Physical, emotional, and mental abuse is seen to break down the ability of these women to fight back and lead to their submission as they feel that few or none other options are available to them.

### **Police Brutality**

Violence against sex workers in India is associated with the perception that they are criminals. Law enforcement use force such as physical torture, emotional abuse, sexual assault and economic intimidation against sex workers. These forms of violence are used to affirm power and control. This has led to further stigmatization of sex workers within society. Within this research, all participants including the female sex workers, staff and the advocate had high concerns regarding police intimidation and false criminalization. Further issues other than just violence and corruption with the system, but also includes the reality of the abuse of law enforcement on the women within the sex industry. Physical, emotional, mental, economical and social abuse leaves these women in a helpless, powerless and untrusting situation, as they remain perceived as criminals, further stigmatized and overlooked for their basic human rights.

## **Mental Health of Sex Workers**

Sex workers in India face several forms of violence ranging from verbal, sexual, emotional, physical and psychological abuse. These forms of abuse take a toll on their mental health and it is a deterrent for them reintegrating into society. It is necessary for these women to enter counselling willingly and discuss the trauma they have endured in the past years living in this work. Within the goal of maintaining and strengthening the rehabilitative process, forms of counselling are provided with the aim of creating a safe and effective space for the women to talk about their endured and cumulative traumas. Even though the process has its challenges, it still maintains itself as an aid in both the women's personal growth and healing, as well as helping in the betterment of proper reintegration back into society.

## **Access to Health care**

Female sex workers are often afflicted with life threatening health conditions. The living conditions in the sex industry further intensify health conditions. Due to these conditions some participants fall ill on a daily basis and only if they are able to make extra money in one night, will they then visit a doctor. On a more severe scale, if female sex workers have genital tract infections or pelvic inflammatory diseases, they tend not to visit the hospitals due to the stigma and fear of shame. The health consequences endured by many of the female sex workers are often life threatening and long term. Further exacerbated by the reality of unclean communal facilities including personal and hygienic spaces, small and cramped living conditions, avoidance of healthcare visits as a result of stigma, rejection and neglect and mistreatment – particularly if not accompanied with an NGO staff member during the visit.

## **Challenges Reintegrating into Society**

Women leaving the sex industry and trying to reintegrate into society presents a paradox. On the one hand, women are coerced into the sex industry due to inadequate or a breakdown of social structures or attitudes. On the other hand, while female sex workers have struggled to leave the sex industry, they have to overcome an additional hurdle of reintegrating back into society which means finding a job, and a home, a change of lifestyle, and a change of attitude and behaviours. In addition to these challenges, sex workers have to negotiate a space in a society which has predominately traditional attitudes concerning the family and the community. These kinds of attitudes, norms and behaviours are taught to women from a very young age. There are many sex workers who are unable to cope with the behavioural, social

norms and attitude changes and they relapse back to what they are comfortable with and the environment they grew up in, which is the sex industry. It indicated that members in society do not accept vulnerable groups such as sex workers into society. Challenges of reintegrating back into society presents a paradox, by which there is a struggle in the fact that most heavily struggle to leave an industry they were initially coerced into. If presented with the opportunity for reintegration, 'freedom' still comes at a cost of overcoming many more hurdles including those of economic, deeply embedded social issues, behavioural, mental, emotional and physical. The reality of the challenges presented to the women upon attempting to reintegrate (even with help), at times even makes it easier for the women to rationalize staying or going back into the brothels.

## **2. SUGGESTIONS**

Although sex work is often dangerous and may include harms, decriminalization can often mitigate these harms.<sup>165</sup> Accordingly, decriminalization seems suitable in most contexts in its recognition of the sex worker's autonomy and liberty.<sup>166</sup> However, a singular model for sex work regulation should not be transposed to all contexts. The treatment of sex work must be localized. As seen during the course of my ethnography, there is no singular sex work, even within the same city or the same locality. Sex work is continuously shifting, and its formations are vulnerable to minor geopolitical changes. The appropriate regulation of sex work will vary by location and may require different solutions to accommodate this. Taking away these women's clients does nothing to redress their economic situation and treats them as infants incapable of independent decision-making. In this way, a perspective that is decidedly intersectional, that is sensitive to overlapping systems of oppression by considering the sex workers' gender, race, and economic status allows for a nuanced analysis of the realities of using sex for work.

## **3. CONCLUSION**

This thesis explores the multiple challenges women face in the sex industry, and all these challenges stem from poor socio-economic structures and inadequate services on an individual level to the poor implementation of policies that criminalize sex workers and gender biases that are deep-rooted within society. This study shows that most of the female sex workers interviewed were coerced into the sex industry by either their family members, financial issues etc.

When analyzing the research question – “Which factors facilitate the rehabilitation and reintegration of former sex workers back into society?” this thesis showcases that organizations such as SWARUMA, in fact, empower women that come out from the sex industry. They empower these women by providing women them with technical skills so they will be able to earn an income outside the sex industry. Swaruma also teaches these women basic life skills such as a coping mechanism to deal with their life skills, and many more. However, these organizations are faced with multiple challenges when they do provide services to such a vulnerable group in society. A few of these challenges include the limited timeframe that women attend Swaruma for their training and counseling, the effects of not dealing with the trauma of their past and the insufficient income they receive once they have left the sex industry.

The victimization of sex workers through police brutality and the stigmatization of sex workers is fundamental to understanding the challenges to reintegrate into society. Due to police brutality and lack of accountability to law enforcement, the women in sex work are unable to trust police officers during the raid. During the rescue instead of protecting the women, they victimize them even further through bribes, emotional and physical abuse. With this research, it is evident that there is a lack of sensitization to sex workers in Kerala when it comes to people in law enforcement. With intense training provided by people who have worked in this sector for several years, law enforcement would be able to get a better understanding of the realities these women face daily. The policies and laws that are embedded in the justice system in India prevent sex workers from receiving a fair trial and therefore are criminalize their existence. Throughout this research, this topic of sex workers is considered to be analyzed under a gender specific domain and whether dealing with these issues needs to be viewed from a more feminist lens. There are both male and female sex workers in the sex industry, but most studies 105 are geared towards a female perspective than a male.

#### **4. AREA FOR FUTURE RESEARCH**

There were multiple questions that stem from this thesis. . Future studies should seek to explore whether women are able to continue accessing services from NGOs and lawyers. To find out the controls or programs that the government implement to support sex workers who will be considered invisible. In addition, more research is needed to explore how generations of sex workers find it difficult to reintegrate into society. For future study, it will be

interesting to analyse the unionization of sex workers in Kerala. The question arise: why sex work out of other possible jobs. There are a lot of other jobs that provide basic needs , more money etc like household work. These jobs don't even need a better educational qualification, they could easily manage their personal life and work life and why they choose this kind of job.

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**APPENDIX**  
**INTERVIEW GUIDE**

1. What are the social problems you faced?
2. What would you like people to know, about the sex industry?
3. What is the worst assumption, people make about sex workers?
4. What was the experience that you have faced in this job from society?
5. What is the biggest challenge of working in a sex work industry?
6. Has this changed the way you seen sex and consent?
7. Treatment of men Vs women?
8. Are sex workers satisfied by doing this job?
9. What were the impacts of being a sex worker?
10. Do any of your family members know about this job? Are they supportive of this job?
11. Have you ever faced vulnerability from society due to this job?
12. Does sex workers, undergo a love life
13. Does this hinder your personal life? 2. Are you forced to wear certain kinds of attires by agents or anyone to get more clients?
14. How many hours a day do you spend working? What do you do most of the time?
15. What would a sex worker do if a client tries to do something by force?
16. 1. Have you ever had health concerns about using non-physical birth control etc?
17. How does the sex worker's maintain proper health condition? (Nutritious food, Proper periods, Proper medications)
18. What are the health issues that they face due to this work?
19. Do you use contraceptives like condoms, when you are with clients? Is the demand for sex workers, who are ready to have sex without any protection high?
20. Does the legalization of prostitution secure the welfare of those engaged in it?
21. What are the economic considerations for female sex workers in Kerala?
22. . Does the unstable economical background lead them to this life?
23. Have you ever raised a child, while you were in this job? If yes, was it difficult and what were the difficulties?
24. Have you received any financial support from others or anyone you know?
25. . What were the movements developed by the society to decriminalize sex workers?
26. How do sex workers fight for survival in age of social distancing?
27. What were the movements or protests initiated the by sex workers?

28. How do sex workers fight against decriminalization?
29. Gains and challenges in the movement for sex workers?
30. Are there any organizations that helped you to raise your voice?
31. . Does different state or countries have different sex work policies?
32. What is sex work like in other state or countries?
33. Why do most men from Kerala visit other state or countries for cheap sex?
34. Is Sex work very much open in other countries?
35. How is the income generated from sex work different in Kerala then that of other states/ countries?
36. How is the legalization of sex work different in states/countries when compared to Kerala?

**EXPLORING THE TROUBLESOME SPACE OF  
BEAUTY IN ZADIE SMITH'S *ON BEAUTY***



*Project submitted to St. Teresa's College (Autonomous) in partial fulfilment of  
the requirement for the degree of BACHELOR OF ARTS in English Language  
and Literature*

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## DECLARATION

I hereby declare that this project entitled “Exploring the Troublesome space of beauty in Zadie Smith’s *On Beauty*” is the record of bona fide work done by me under the guidance and supervision of Ms. Vinitha John, Assistant Professor, Department of English.

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## CERTIFICATE

I hereby declare that this project entitled “Exploring the Troublesome Space of Beauty in Zadie Smith’s *On Beauty*” by Lisha Antony is a record of bona fide work carried out by her under my supervision and guidance.

Ms. Vinitha John

Department of English

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March 2022

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**An Abstract of the Project entitled**  
**Exploring the Troublesome Space of Beauty in Zadie Smith's *On***  
***Beauty***

**By**

**Lisha Antony**

**BA English Language and Literature**

**St Teresa's College (Autonomous)**

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**2019 – 2022**

**Supervising Teacher: Ms. Vinitha John**

The British author Zadie Smith's novel *On Beauty* is an intrinsic study of beauty. *On Beauty* is an analysis of family life, the institution of marriage, intersections of the personal and political, and an honest look at people's deceptions. The novel discusses the question, which is more appealing, inner, or external beauty. The aim of this project titled "Exploring the Troublesome Space of Beauty in Zadie Smith's *On Beauty*" is to do a character analysis and to review how both moral beauty and aesthetic beauty is being abused and exalted in the novel so that in the real world, people would avoid missing the inherent essence and appreciate the moral beauty in individuals. The first chapter conceptualises beauty and explores its distinct meanings through varied theories. The second chapter is a character analysis to observe how each character in the novel values and appreciates beauty from different perspectives. The project is an attempt to create a thought in people about their own acceptance of the way they are, despite their physique.

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## Introduction

*On Beauty* is an intriguing and emotional propounding fiction by the British author Zadie Smith which traverses through fragile bonds that exist between relationships. Zadie Smith's third novel *On Beauty* (2015) is a tribute to E.M. Forster. Smith in the novel, chose an ethical strategy different from Edward M. Forster to present problems. Edward M. Forster created his characters as more complex and chaotic, making it very difficult to evaluate in terms of ethics. Smith's novels have ideological inconsistencies which make it difficult for a literary critic to interpret her novel with their coherence. But following Zadie Smith's guidelines, critics can interpret the novel in a way Smith wants.

Bonny Finberg commented that Zadie's novels always have a sense of play that is immensely funny and compassionate which transcends gender, race, and culture. This funny but engaging tale, *On Beauty* revolves around the lives of a mixed race British-American family. The novel revolves around the cultural differences between two countries, the nature of beauty and reflects on the liberal and conservative views within a community.

The British-American family in the novel consists of a white father Howard Belsey and a black mother Kiki, who have been married for thirty years, but now their marriage is in trouble as Kiki found out that Howard had an affair. They have three children, Jerome, Zora, and Levi. Jerome is a religious person and is studying abroad at Brown University. Zora is a freshman at Wellington College while Levi is still in high school. The Belsey family is very liberal and atheist in nature except for Jerome, who is interning abroad with Monty Kipps in London. Monty belongs to Kipps' family who are very conservative. The Kipps consists of Monty and his wife Carlene and their children, Michael, who is working in finance and a very stunningly beautiful Victoria who is eighteen years old. Jerome is deeply and madly in love with Victoria and is nearly engaged with her, which worsens the conflict between him and

Howard.

*On Beauty* is the definition of beauty according to the novelist's viewpoint. In western philosophy, beauty has got many definitions and theories. Beauty is a pleasure or an emotional element according to western philosophers. Since the beginning cultures, beauty, truth, and goodness act as a triad. The character Kiki exhibits this triad of beauty, goodness, and truth. Beauty can either be inclusive or exclusive. The exclusive beauty diminishes with ageing and is painful, especially for women and this has been portrayed beautifully. Victoria's character is described as "the most incredible looking woman ... ever seen" (388), an ideal beauty. The novel shows the amount of effort and pressure a young woman must put in to meet this idealisation of beauty. The idealisation of beauty influences the self-image and the actions of not only young women but also middle-aged men and women. The inclusive beauty of a human being is best portrayed by the character, Kiki. The attributes of inclusive beauty and the goodness and truth of the character Kiki is being exhibited throughout the novel. The novel also shows how people overvalue external beauty and make mistakes.

The idealisation of beauty also impacts the actions of men, which can be observed in the story of Howard. All his actions were driven by the external beauty which is a pleasure according to western philosophers. The story of the character Claire with whom Howard had an affair, also shows how the appearance of a human can control their desires. The life of Katie also shows how exclusive beauty can impact a person's thoughts.

*On Beauty* is a novel by an English Novelist Zadie Adeline Smith, also known as Zadie Smith. Smith is known for the humour, dialogues, and eccentric characters that she uses in her works. Smith's debut novel *White Teeth* won several awards, including Women's Prize for Fiction and became a bestseller. The author has also won the Orange Prize for Fiction and the Anisfield- Wolf Book Award in 2006. Her writing style is reflected at the

same time witty. *On Beauty* can be interpreted in terms of beauty, goodness, truth, feminism, multiculturalism, racism and much more. Feministic approach can be very interesting as Zadie focuses more on female experiences. According to Andrew Hay, *On Beauty* reflects Zadie Smith's delight in forming connections between and two books. In the preface of *On Beauty*, Zadie acknowledges the academic specialty of her protagonist, Howard Belsey, a middle-aged Rembrandt scholar. Andrew Hay commented that the readers of *On Beauty* do not require any knowledge of *Howard's End* to enjoy Smith's descriptive acuity.

The novel *On Beauty* by Zadie Smith defines beauty in many novelistic ways. The aim of this project titled "Exploring the Troublesome Space of Beauty in Zadie Smith's *On Beauty*" is a character analysis and review how both moral beauty and aesthetic beauty is being abused and uplifted in the novel so that in the real world, people would avoid missing the inherent essence and appreciate the moral beauty in humans. Chapter one "Conceptualizing Beauty" outlines how the community views the aspects of beauty and how they criticise and defines it based on the external features of fellow beings. It is through the eyes of Zadie Smith, we here analyse the concepts of beauty. Here the intrinsic beauty of an individual is given importance rather than the external one. The chapter provides an outline on how fashion and culture has also influenced in determining a person's beauty. Chapter two titled "Direful Beauty: Understanding the meaning of beauty in *On Beauty*" briefly explains the summary of the novel *On Beauty* and attempts to analyse the story within the framework of the ideas and concepts as discussed in chapter one. The novel discusses the ideas of two different families on beauty and how they finally conclude intrinsic beauty survives deeper.

## Chapter 1

### Conceptualizing Beauty

The various criteria of beauty differ among different communities and their cultures. The consonant roots of beauty are affecting the individual, marginalising community lives and their identity since long back. Jezebel, a figure mentioned in the Old Testament of 2 Kings 9:30, is seen using cosmetics to paint her eyelids during the early 840 BC. The book of Esther too mentions beauty treatments. In this present day's world also, when people are asked to define beauty, most start by describing the physical features of a person. Extrinsic beauty is valued extremely higher than intrinsic one, which is a reality. The beautiful soul of a woman is not considered above her extrinsic qualities from the olden times. People, to content the lust and desire of their body as well as their eyes, consider and point out only the physical features over the inner ones while describing beauty. "In the case of beauty ideal, women who achieve a high degree of attractiveness are psychologically and socially rewarded" (Grauerholz 713).

The question, which is the most appealing one, inner or external beauty, seems to be one of the debating topics which existed from the beginning of humanity and will continue throughout. A person's character and behaviour are what his beauty is. This sort of beauty within a person helps him or her to accept and appreciate people and the community despite their physique. It creates a thought or idea that people are beautiful in their own way. Tall or short, thin, or fat, dark or fair, or even rich or poor does not describe the beauty of one's soul.

Men maintain their superiority in society by oppressing and subjugating women. In *The Second Sex*, Simon de Beauvoir describes the situations and emotions of women under these circumstances. "One is not born, but rather becomes, a woman" (Beauvoir 283). Femininity is not the difference in intellect, psychology or biology rather reflects differences in the situations of men and women. Woman is born fully formed, but is shaped and learns

her role of a man and society. The author tries to showcase that women are neither born feminine but are moulded into such a perspective by subjecting them and forcing them through the ideals of beauty, where she is taught about the ideologies of being submissive, inward, kind, passive, non-essential and dependent. The outside forces that rob her rights are not just cosmic forces, but are the result of circumstance and culture and thus are human choice. The beauty of women is taught to her as much as her perfection in the household and childbearing. She is asked to wear makeup by society. She is questioned for not wearing jewellery and is declared ugly by the society. “Any genius born a woman is lost to humanity” (Sohoni 115).

The blend of youthfulness and age are seen as the measures of beauty in a female. Simon de Beauvoir in her work, *The Coming of Age*, brings into consciousness, how society and its citizens view old age and how they marginalised people based on beauty. Instead of considering old age as a sign of the natural ageing process, women were easily convinced by society the necessity of looking young, to be sexually attractive and beautiful, thereby becoming an advantage and a benefit for the advertisement industry. The work is of two parts where the first part is about how the society and citizens view ageing and how the families treat the aged ones. While Beauvoir in the second part recognizes the myth and reality from the perspective of senior citizens. The writer says that older ones despite ageing still have feelings of youthfulness, which is underestimated by society. Here the reader is challenged by the senior citizens, asking them to change their destiny if possible. “Society cares about the individual only in so far as he is profitable. The young know this. Their anxiety as they enter in upon their social life matches the anguish of the old as they are excluded from it” (Beauvoir 543).

Gentle, calm and fair-toned women, who serve as subjugates of men are portrayed as beautiful and are considered as the symbols of ideal femininity in advertisements. They were

able to easily persuade women with the notion that it was the duty of every woman to look beautiful and young. Beauty products advertised by the media are unfortunately considered a necessity by women, which thereby profited the multinational companies. The idea of casting well-known public figures in advertisements helped in cementing the idea of ideal beauty in women. The words like ‘natural glow’, ‘self-transformation’ attracted widespread interest in female figures to sign self-contracts from being young and attractive. “Adolescent girls in Currie’s study reported that “feeling good about themselves” depended on “looking good”” (Grauerholz 713).

The moral characteristics were unconditionally denied over the physical ones in the case of African- American women. The persistence of the society on the deeply embedded external paradigm brought in the erroneous meaning of beauty into the perception of mankind. The distorting lens through which one investigates beauty gives only a partial vision of external features without letting know the merits and prestige of the inner beauty. Thus, such fallacious ideologies gave rise to different cultural habits which then started oppressing the ones with low external features. Thus, a cultural delight started being celebrated by the supremacist ones where they themselves created and enjoyed privileges. Thus, light-coloured women, especially, became the identity of femininity. Beauty based on colour was a tool that enabled the Whites to subjugate the Blacks. Black African women were treated and considered masculine and were made slaves and given ruthless punishments. “Enslaved males and females were considered “chattel” in the antebellum United States without legal rights to their person or protection from sexual violence” (King 173).

The nexus between femininity and beauty remains incredibly resolute, even after the emergence of fostering developments like the right to vote. The status of women with beautiful extrinsic features is considered higher compared to others. In African American societies, white women are elevated nearly to the status of a goddess. Fairness, straight hair,

beautiful facial and bodily features described femininity and attractiveness. As a result, women were forced towards the use of beauty products, bleaches, dyes, underwent surgeries and many more. Even the products in markets were mainly to secure whiteness, straight and shining hair and scar-free face, as the ideals of beauty. This knowingly or unknowingly created a sense of inferiority complex among its consumers. “Children’s fairy tales, which emphasize such things as women’s passivity and beauty, are indeed gendered scripts and serve to legitimize and support the dominant gender system” (Grauerholz 711). In fairy tales, like *Cinderella*, *Snow White*, *Sleeping Beauty*, *Rapunzel* all were young girls with beautiful skin, eyes, lips, hair, smile and many more. Cinderella, despite being a very calm girl by nature has looked at with jealousy by her ‘cruel’ cousins, here beauty is what defines Cinderella’s character, she even asks her fairy godmother to help her look beautiful to attend the ball. In the case of *Sleeping Beauty*, the prince is attracted to her only because of her beauty similar to the story of *Snow White*, where her stepmother decides to kill her only because *Snow White* is revealed as the most beautiful woman of all. *Rapunzel*’s hair is what attracts her lover. “The dynamic relationship between gender, power, and culture as well as the cultural and social significance of beauty to women’s lives can be clearly seen while studying the significance of beauty from the fairy tales” (Grauerholz 712).

Beauty is the language and vestment of a person’s inner self. When every creature in the Universe follows this rule of intrinsic beauty only the degenerate men violate this rule. Women are considered sexually qualified when they are very young. Only a few find the value of inner beauty over the external one. The bedraggled and shady ideas, talks, thoughts and concepts, the knowledge dearth is some of the reasons why people don’t concentrate on the allure soul. Developed societies consider the abnormal discriminations of beauty as the basic human criteria to judge others. An individual can see the inner characteristics of his or her fellow being only when the individual’s mind has the ability to grasp, and his soul has the

feature to feel the other. Only then a human is complete and can identify the co-being's intrinsic beauty, neglecting the extrinsic one.

Beauty matters from the eyes of the viewer. People believe beauty is to be enjoyed with the eyes, but most philosophers, poets, writers, musicians and artists claim beauty is to be felt by the heart and soul. *Phenomenal Women*, by Maya Angelou is an example of such a poem where the poet describes her inner self as more alluring. Shakespeare in his *Sonnet 130*, *My Mistress' eyes are Nothing Like the Sun*, says his beloved's eyes are not like the sun, her skin is not as white as the snow, towards the end he accepts her as a beautiful one who is not to be compared to anyone else based on her exotic features. Objective beauty remains only within the eyes of a spectator, but subjective beauty remains within his soul. The essence of beauty lies within the inner soul of an individual. Beauty does not only mean something that pleases the sight, but also means something for your inner self that defines your basic feature. According to Naomi Wolf, it is women who criticise themselves, women consider themselves as inferior to men, even after recognising their rights and acquiring freedom. "The social importance of feminine beauty ideal lies in its ability to sustain and to reproduce gender inequality" (Grauerholz 713). Wolf described in her work *Beauty Myth*, that beauty varies from society to society and thus has become the universal symbol of fertility and strength. Here myth is described as an order that precepts behaviour and not appearance. Ideas such as cosmetics, cosmetic surgeries, diet and many such improved the capitals of industries due to the unconscious anxiety of women. Wolf describes how women are seen and socially accepted to look physically beautiful, to make themselves fit and dressed. Beauty myths subjugate women to demeaning aesthetic ideals. This definitely has a personal impact on women, as a result of psychological tyranny. "A culture fixated on female thinness is not an obsession about female beauty, but an obsession about female obedience. Dieting is the most potent political sedative in women's history; a quietly mad population is a tractable one"

(Wolf 196). Wolf also noted that these existing prejudices did apply for men also, though in a much lesser impact. “The feminine beauty ideal can be seen as a normative means of social control whereby social control is accomplished through the internalization of values and norms that serve to restrict women’s lives” (Grauerholz 713).

In the field of culture and fashion, politics has made us annihilate our capacity to appreciate the charm and reveal the beauty of humankind as it is. “Value constructs such as “nice girl” or “feminine beauty” operate as normative restrictions by limiting women’s personal freedom and laying the ‘groundwork and the circumscription of women’s potential for power and control in the world’” (Grauerholz 713). The existence of patriarchy is one of the dominant features for the perseverance of the redundant notions of external beauty in society. “A further paradox of the feminine beauty ideal is that, in a patriarchal system, those women who seek or gain power through their attractiveness are often those who are dependent on men’s resources” (Grauerholz 712). The aesthetic judgement of beauty is also an affecting factor.

Men are valued for their works rather than their looks, but in the case of women, the reverse is seen to be true. Women are judged on the basis of their physical appearance rather than their works and achievements. “Sontag’s claims that physical appearance trumps all as the evaluative means of a woman’s worth may well be overblown, but we still live in a society wherein a woman’s physical appearance (whether or not she is considered physically attractive or sexy) continues to matter more for women than for men” (Brooks 20). The appearance of grey hair and wrinkles on a woman’s face are penalised to a greater degree than men. This inconsistency in gender based on beauty is what Sontag refers to as the ‘double standard of ageing’. “This society offers even fewer rewards for ageing to women than it does to men” (Sontag 6). Both men and women are to experience equal social status in economic and occupational areas. Every individual is to adopt a lifestyle where healthy and

active body features are appreciated more than physical ones.

Physical appearance of a person is an exterior output he provides for himself, it's his extrinsic character that he lets others know. But this is regarded as the most required one by the society and its citizens. The required intrinsic beauty is left unrecognised. Age, sex, race and community is what sadly defines an individual since long back. Despite all these aspects people are to be accepted in their own manner.

## Chapter 2

### Direful Beauty: Understanding the meaning of beauty in *On Beauty*

Today, when someone is asked to describe the beauty of a person, they will start by describing the person's physical features. Only a few people will talk about the person's real intrinsic beauty. Extrinsic beauty of a person is valued over the inner beauty of that person. A woman's external features conceal her inner beauty, and this has been portrayed beautifully in Zadie Smith's *On Beauty*. A good-looking elegant woman with beautiful physical features is always found to be more attractive than a woman with a beautiful soul. And a man like Howard would always value external beauty over inner beauty to satisfy the desires of his eyes and body.

What is more appealing, inner beauty or outer beauty? Inner beauty and outer beauty have been topics of debate since the beginning and will always be. Inner beauty is something that can be defined as an experience from a person's personality, character, behaviour, attitude and more. Intrinsic beauty will help people to find the real beauty of others; it will help people to appreciate others for what they are despite their looks and physique. On the other hand, outer beauty is not just about appearance and physique. Fame, wealth, position, academics, status etc. can be part of outer beauty. Howard Belsey and Monty Kipps had a good status and were academically excellent which added to their external beauty. Both Howard Belsey and Monty Kipps were lustfully greedy and failed to appreciate the real beauty of their wives.

*On Beauty* is a novel by Zadie Smith set in the post-colonial period on a fictional campus. In the novel, various forms of abuse towards beauty can be observed and are portrayed by various characters. Howard Belsey is an angry young white man originally from England and is an art historian in Wellington college. Howard is a very enthusiastic and dedicated professor who is very slim and slender. Howard's inattentiveness to beauty is

evidently reflected in his everyday life. He is also inattentive to the emotions of others, especially his wife Kiki. Victoria Kipps, one of his students, suggests that Howard does not appreciate the beauty of his wife Kiki.

Though Howard has an intelligent attitude, he could not distinguish between sensuality and beauty. His insensitivity towards Kiki's love, his extramarital affairs with his colleague Claire and later with his son's ex-lover Victoria Kipps, ruins his family life. Both Victoria Kipps and Claire Malcom do not know how to handle their sex appeal. The love sequence between Victoria and Howard shows how passive Howard is. Howard's ignorance of inner beauty matches his moral depravity. Howard's academic nemesis Monty Kipps, father of Victoria Kipps, is the other side of the coin, a traditional Christian. Monty always acquires popular support successfully. Even though Monty is a celebrity scholar, instead of explaining more about art and beauty, he uses beauty to express his political ideology. Monty is very greedy and lustful like Howard. He also ruins his marital life by having an extramarital affair with one of his students.

Attitudes of both Howard and Monty show how inattentive they are to the inner beauty and emotions of other people. They value external beauty over inner beauty to satisfy their lustful desire. In the satire *On Beauty*, both Howard and Monty keep on talking about art and beauty, but that is only for their academic purposes. Beyond that, they are only attracted to external beauty that satisfies their greed and lust. Though Howard and Monty are art history professors, they have very opposing views on everything, and they never really appreciate art or beauty. For women, outer beauty is a blend of youthfulness, sex appeal, age and so more. In western culture, any woman who is not very young is considered old. American writer Susan Sontag quoted in *The Double Standard of Ageing* that since women are considered maximally eligible in their early youth, "being physically attractive counts much more in a woman's life than in a men, but beauty, identified as it is for women, with

youthfulness, does not stand up well to age” (Sontag 32). Sontag also adds, “for a woman to be obliged to state her age, after a “certain age” is always a miniature ordeal” (29). Most of the women are considered sexually qualified only if they are very young.

Zadie Smith emphasizes the relation of beauty, age, and sex appeal through various characters of *On Beauty*. Most of the young girls during their late adolescent age start to get worried about their marriage as they must satisfy young men with their outer beauty. On the contrary, men’s desirability for women is not at all tied to their youth. The beauty of men and husbands rests on what they do in their lives rather than their looks. Most men are romantically more successful at the age of forty than they did when they were young. Fame, money and power enhance the sexuality of men more than what external looks do. In *The Double Standard of Ageing*, according to Sontag, men are more sexually desirable and physically attractive than women in their older ages. “A man’s facial lines are taken to be signs of ‘character’. They indicate emotional strength, maturity... (They show he has ‘lived’.) (Sontag 18) .... “But lines of ageing, any scar, even a small birthmark on a woman’s face, are always regarded as unfortunate blemishes” (Sontag 18). *On Beauty* gives implications that the appearance of midlife men is not affected by ageing as it does for women. Men can use ageing to their advantage; an aged look will give them professional maturity. Howard's assistant, Christian, who is twenty-eight, tries to look old because it will give him professional advancement and will help him with the land tenure.

Intrinsic beauty of women has many dimensions. Inner beauty of a woman purely lies in the way she thinks, her personal confidence, her character, her strength, her compassion, her feelings for others, her patience, her optimism, the way she adapts to or reacts to any situation thrown at her. Every female character of *On Beauty* showcases multiple dimensions of inner beauty and strengths in different scenarios.

Kiki Simmonds Belsey is an Afro-American woman from Florida. The noble-looking

woman is married to Howard Belsey and is a mother of three. Kiki has a very beautiful soul and a very forgiving character. Arguably, Kiki is the most intrinsically beautiful person in *On Beauty* as she showcases her strength of forgiveness when she finds out about her husband Howard's extramarital affair, to save their thirty-year-long marriage. She also shows strength when she finally decides to get separated from Howard. Kiki is a woman who accepts her sexual flaws due to ageing. "But life is long, and so is marriage...The metaphors won't work. And who cares, anyway, for technicalities when that starburst of pleasure and love and beauty is taking you over?" (Smith 397). The comment about how 'long' marriage can be, shows that Kiki has accepted the fact that her body is no longer adjusted to make love as she once used to. Zora, daughter of Kiki humorously criticises her mother's current physical appearance to Carl and Carl replies to this by commenting, "fat ladies need love too" (159). The world is concerned about physical appearance. Although Kiki is ballooned to two hundred and fifty pounds, she deserves love, care, and respect. The comment made by Carl not only points towards Kiki but to all the women who have got the extrinsic beauty deteriorated as part of ageing.

In 2016, 'The Girlguiding Girls Attitudes Survey' reported that 40 percent of one thousand five and five hundred young girls surveyed felt they were not pretty enough. One out of every six girls felt ashamed or embarrassed of how they looked. The study showed how much importance was given to extrinsic looks by young girls. Almost 40 percent of girls aged between seven and twenty-one did not feel happy with their looks in 2016, compared to 27 percent in 2011. Howard's observation from Wellington ball showed how much effort young girls put to perfect their extrinsic looks.

In January, at the first formal of the year, the tremendous willpower of Wellington's female students was revealed. Unfortunately for the young women, this demonstration of pure will is accredited to 'femininity' – that most passive of virtues – and, as a result, does

not contribute to their Grade Point Average. It is unfair. “Why are there no awards for the girl who starves herself through the Christmas period – refusing all sweetmeats, roasts and liqueurs offered to her – so that she might appear at the January formal in a backless dress and toeless shoes, although the temperature is near to freezing and the snow is heavy upon the ground” (Smith 341).

The observations of Howard are so relevant in the real world. Young women are very conscious of the thoughts of other people about their looks. Zora, daughter of Kiki on her first day at school, dresses in the most fashionably ridiculous way to impress her peers. “Zora woke up in the morning hopeful that a transformation of this kind might have visited her in the night, but, finding it hadn’t, she did what girls generally do when they don’t feel the part: she dressed it instead” (Smith 129). She dresses in somewhat ridiculous clothing, such as a “long boho skirt”, “man’s hat” and “clumpy shoes” just so that her peers will regard her as a “bohemian intellectual; fearless; graceful; brave and bold” (Smith 129). Zora is a brave fearless girl by appearance and wants to exaggerate these attributes through her fashion and dressing so that her peers would admire her.

Zora is a girl of immense boldness. There are many instances in *On Beauty* proving the same. Zora is very brave to open her mind and confront university authorities regarding the mistakes they committed, and she also advocates for the underprivileged. These actions of Zora shows her empathetic mind which adds to her intrinsic beauty. Kiki’s daughter also shows her strength by confronting her boyfriend Carl regarding his relationship with Victoria. She also has disputes with her father Howard for having an affair with her brother Jerome’s ex-girlfriend Victoria.

The extrinsic beauty of a person always hides the true character of a person and outside beauty won’t last forever. It will eventually deteriorate with age and health. As many instances in *On Beauty* suggests, Zora is a bold fearless girl outside, but she is very insecure,

and this is being covered up by her bossy attitude. At a point, the novel very transparently shows that Zora is most concerned about the opinions and judgments of other people about her. One day on the way to the pool she stops and starts pondering about how other people perceive her.

She asked herself the extremely difficult question: What would I think of me? She had been gunning for something like bohemian intellectual; fearless; graceful; brave and bold. Still living at home, still a virgin, and yet heading for her first day as a sophomore. Last year, when Zora was a freshman, sophomores had seemed altogether a different kind of human: so very definite in their tastes and opinions, in their lives and ideas. Zora woke up that morning hopeful that a transformation of this kind might have visited her in the night, but, finding it hadn't, she did what girls generally do when they don't feel the part: she dressed it instead. (129)

Zora uses her fashion sense and dressing as a tool to overcome her insecurities. As the novel suggests, every young girl finds extrinsic beauty as a tool to hide their weaknesses and fears. Zora is in a way trying to fight and overcome her insecurities, which shows her urge to become a better person. Zora participates in a lot of university work and sports. She even tries to come up with a “Zora Self-Improvement Programme” (Smith 129). Her determination is her strength which makes her intrinsically beautiful.

Victoria Kipps is an eighteen-year-old girl like Zora who fights her insecurities with her extrinsic look. “You have to have your cock strapped to your leg when you pass” (345). This line shows how sexually beautiful Victoria is and how the novel *On Beauty* portrays Victoria as an ideal of sexual beauty. Victoria is admired throughout the novel for her looks, and she undergoes a lot of struggles for that kind of sexual look. But most of the time those struggles do not produce the desired results. Victoria is aware that her extrinsic looks and the effort for that just produce a one-dimensional sexual impact on guys which is very short-

lived. When Howard wanted to end his brief extramarital relationship with her, Victoria tells him, tearfully, touching her face, her breasts, her hips, “that’s what you know. But you don’t know me. And you were the one who wanted this – that’s all anybody ever” (390). Every guy who sees Victoria has a sexual attraction towards her due to her physical beauty. When we compare both Zora and Victoria who put in so much effort to look extrinsically beautiful, Zora’s behaviour is more sensible. Her effort is to create her own identity by overcoming her insecurities with fashionable outer looks. “Women’s concern with their appearance is not simply geared to arousing desire in men. It also aims at fabricating a certain image by which women state their value. A woman's value lies in the way she represents herself” (Sontag 23).

Most of the women out there like Zora and Katie see external beauty as a tool to boost their confidence and gain acceptance from the public. Katie is very shy and thoughtful. She has an abundant number of insights about art. In Howard’s art class, even though Katie has insights, she remains silent because “it is the incredible-looking black girl, Victoria, who speaks, and as ever she has a way of monopolising Dr. Belsey's attention, even when Katie is almost certain that what she is saying is not terribly interesting” (Smith 252-253). Katie believes that she is less valuable in class as she is not as attractive as the black woman Victoria. This instance shows how young women value external beauty over intelligence.

Considering the old character of Carlene, who also has had the same struggle and pressure of maintaining the extrinsic look as Zora and Victoria, she gains other people’s acceptance with her intrinsic quality of honesty and care. Carlene has a good genuine friendship with Kiki and starts it with an honest unkind comment on Kiki’s weight. Carlene has concern for the people around her; she is attentive to other people’s emotions, feelings, life situations and so more. She acknowledges the struggle she has undergone in her youth to maintain her beauty for the approval of others. But as she ages, she learns to accept herself and replaces her anxieties with self-acceptance and self-worth. Carlene is a very intrinsically

beautiful lady whose mind has immense strength; she was battling cancer throughout her life without telling anyone. The pain of cancer was killing Carlene day by day, but because of her concern for other people, she does not let her close ones know about it. Only her death revealed this devastating fact to her family.

Creating an authentic identity for oneself can add to intrinsic beauty and looks. A person with such an identity will attract any other person in the room. The socially accepted standards of beauty are mostly associated with white bodies and hypersexuality is mostly associated with black bodies. Since mixed-race people possess both ideal standards of beauty and hypersexuality, they are found to be more attractive than other races and they are the ones most preferred for television shows, fashion shows, programs etc. *On Beauty* portrays not only beauty struggles, class issues, or marital issues, but also racial issues as well. Levi is the most affected guy with racial issues apart from Kiki, his mother. Around the globe, it is a certainty that mixed-race people are considered very attractive and beautiful. Studies reveal that mixed-race identity is considered very attractive. Perhaps, it is considered more exotic than traditional singular racial identities.

Levi is the youngest child of the Belsey family. He is portrayed as a sixteen-year-old, good-looking young teen who wants popular acceptance and uniqueness. He is the son of a Caucasian father and a Black-American mother. Because of this, Levi faces many racial and identical issues in his academic community. He is not involved much in his schoolwork and is intellectually and academically detached. Levi loves the black culture and believes that being black will make him different and look cool. For Levi, having an identity is an important element for both his intrinsic and extrinsic beauty and for the purpose of creating one for him. Therefore, he distances from his white lifestyle, becomes a rebel, and quits his job. Levi chooses the extreme route by joining the illegal street vendors with black street culture and hip-hop culture. Though he is emotionally affected by Haiti issues, he is not as

intellectually stimulated as his siblings. Eventually, he joins a group of Haitian street hustlers.

A special ethical dimension can be observed in Zadie Smith's *On Beauty*. On a general level, every situation, human character, and relationship will imply ethicality. Smith always creates her characters with different layers of moral problems, in turn bringing the characters to life. Hence Zadie Smith's *On Beauty* explores a great deal various perspectives like intrinsic beauty, extrinsic beauty, culture, class, race, identity issues and so more. Also, it is relatable to all types of people like educated, uneducated, black, white, young, old, beautiful, ugly, wealthy, poor and so more with all sorts of ingredients. Inner beauty and outer beauty have immense importance in defining one's character and identity. The physical features of a person will fade over time and ageing cannot be controlled. Intrinsic beauty and character of a person can be controlled and would not fade over time.

## Conclusion

People admire fair skins and flawless bodies in advertisements, beauty pageants, movies, etc. making them insecure about their own bodies and looks. Robin Givhan in his article 'Women of Impact', which was published in the National Geographic Magazine, talks about Alek Wek, a Black Sudanese model with velvety ebony skin who appeared on the cover of the U.S edition of magazine *Elle*. The concept of fair skin, skinny body and silky straight hair created emotional trauma in many communities as well as in individuals. The ones who owned these features were appreciated and welcomed more than others. It was at this point of time, Alek was introduced as a sign of beauty to break the stereotypes. Alek was introduced to overcome the negative connotations of beauty. He says "Wek was a new vision of beauty - that virtue forever attached to women. It has long been a measure of their social value; it is also a tool to be used and manipulated. A woman should not let her beauty go to waste; that was something people would say back when a woman's future depended on her marrying well. Her husband's ambition and potential should be as dazzling as her fine features" (Givhan and Reyes Morales). How can a person be judged unattractive? If people can't see the beauty of the other person, then he or she is blind to other people's humanity or intrinsic beauty.

The novel *On Beauty*, by Zadie Smith clearly addresses the cultural and conservative ideologies of beauty. The writer is against the concept of considering beauty as superficial concerns of appearance. The female characters of the novel reflect different dimensions of beauty at various ages.

Victoria is considered the most attractive and sexually desired woman in the world by men; she uses her extrinsic beauty to lure men for her benefit. Smith depicts her as a young strikingly beautiful black girl who could not be resisted by any man due to her charming

looks. She has a flirty-like character and uses her beauty and sexual allure for her self-pleasure. She thus represents trends of modern beauty and the black woman's voluptuous figure. The young male characters in the novel accept her and young women reject her. Katie, the other female character in the novel, is an intelligent young woman who considers herself worthless as she is not as attractive as her classmate Victoria. Katie, despite preparing for Howard's class discussions and due to her shyness and her physical looks being not as good as Victoria's, is unable to gain the professor's attention, even though she was better in intriguing and had valid arguments. Zora, on the other hand, dresses in the most fashionably ridiculous way to elevate her confidence level. She is not at all satisfied with her looks and blames Kiki for Kiki's approach towards her physical appearance. She even justifies Howard's relationship with Claire as a result of Kiki's poor attitude towards her extrinsic looks. Both Zora and Katie use dressing as a cover-up for their insecurities. For these ladies, extrinsic beauty is the one that defines their character and determines their acceptance in the society. The first thing that comes into mind for Zora is fashion and involving herself in her appearance.

On the other side, there are not so young female characters like Kiki and Carlene in *On Beauty*, who appreciate small things and find beauty in everything. When they were young, they have also undergone the struggles to fit into the concept of ideal beauty set by society due to the influence and pressure of the community. But their life experiences taught them to appreciate the God-given intrinsic and extrinsic beauty even in their struggling periods. Carlene is seen fighting cancer throughout her life while serving her family faithfully. Even after coming to know about her husband's extra-marital affair, Kiki is willing to forgive her husband and continue their married life. Both Kiki and Carlene maintain a good relationship and are concerned about others and their emotions. Kiki contemplates how

girls tend to lack confidence and give too much relevance to their appearances. “This is why Kiki had dreaded having girls: she knew she wouldn’t be able to protect them from self-disgust. To that end she had tried banning television in the early years, and never had a lipstick or a woman’s magazine crossed the threshold of the Belsey home to Kiki’s knowledge, but these and other precautionary measures had made no difference. It was in the air, or so it seemed to Kiki, this hatred of women and their bodies – it seeped in with every draught in the house; people brought it home on their shoes, they breathed it in off their newspapers. There was no way to control it” (Smith 197-198). According to Kiki it's the insecurity in the minds of girls that tends them towards their external beauty.

Kiki is conscious of her weight, and she interprets Howard’s lack of attention to her as her being unattractive. Howards changes are the result of Kiki’s physical appearances, says Smith. Although Kiki was once very beautiful, she does not have the same figure anymore. Kiki is seen feeling embarrassed due to her body parts, especially her stomach which she hides purposefully. She makes numerous changes in her hair and does not allow it to flow around her head naturally. It is also seen that Kiki’s insecurities regarding her looks are not her own, in fact, they were imposed on her by the society. This is clear when she shares her ideas about women and their interest in physical looks with Carlene. “I see Zora worrying all the time about her looks, and I want to say to her, honey, any woman that counts on her face is a fool. She doesn’t want to hear that from me. It’s how it is, though. We all end up in the same place in the end. That’s the truth.” (173). So, what is the true beauty of a woman? Audrey Hepburn, a British actress, humanitarian, and campaigner, once quoted that “the beauty of a woman, with passing years, only grows!” (Haigh).

“*On Beauty* is a fictional account of the quest for racial authenticity among African Americans” (Warikoo 2). The novel exposes the variability and intersection between class

and race based on the concept of beauty. “Smith’s depictions of the complexity of the black American experiences are a refreshing antidote to the sometimes-sloppy use of racial categories we fall back on as social scientists interested in crunching numbers and looking for broad racial patterns” (Warikoo 470). Race is a secondary phenomenon that results from the caste system, says the sociologist Howard Winant. The physical characteristics of a person like skin colour or hair texture is what race means. Ethnicity or class is related to the cultural expression and identification of a person. Both are used to categorise and characterise people and their communities. Racial prejudice over hierarchies privileges people with white skin over people with darker skin colours. In the novel both the families, the Belsies and Kippses are partially black and do come from privileged black families. The Belseys are of mixed race with social significance. A twenty-year-old black young man Carl is stuck up with them. He is in a formal friendship with Zora from the Belsy family and involves in a sexual relationship with Victoria from the Kippses. But this stratification is seen even within a race. In a party when Belseys argues with Carl, to which Carl says that “**intellectual** blacks think they are “too good for their own people” (418). Here Carl’s class and race are questioned. Meanwhile, it is seen that Zora is having a secret one-sided attraction to Carl only because of his physique. There are instances in the novel where the objects are portrayed in white or black shades. Like the “white teeth”, “black hole” and “black mood”, which are the reflections of the existing black and white racial divide and social issues. These depictions show how important race and external appearance are for the two dominating families.

Beauty radiating from inside is what is important, it doesn’t matter what one wears or what fashion one follows. The qualities and positive characteristics of a human make the world a better place to live. As a woman who values inner beauty over outer beauty, Chris Haigh quotes that, “the beauty of a woman is not in the clothes she wears, the figure that she

carries, or the way she combs her hair... True beauty in a woman is reflected in her soul. It's the caring that she lovingly gives, the passion that she shows, and the beauty of a woman only grows with passing years" (Haigh).

Like in the novel *On Beauty*, today in this fast-moving technologically advancing world, perfect beauty is defined and described by social media. People's perceptions of beauty have been heavily influenced by social media. There are various applications where people can interact with any other person in any part of the world just by creating a profile. Social media has evolved from being just a platform for interaction to a field that defines what is 'perfect and beautiful' to young girls and boys. "This has a very negative impact on the self-esteem of today's generation" (Smith). One study reveals that thirty minutes of social media usage can change the perception of young girls about extrinsic beauty. Today, young women are insecure about their body shape and features and studies show how deeply the thoughts of young men and women are being impacted. In modern times, being thin and fair is considered beautiful and young teens are struggling and working very hard to achieve this. Young women are very self-conscious about their looks and what others think of them. Zora in the novel too dresses and keeps herself attractive to impress her peers. Zadie Smith in her novel is against notions of beauty being treated only extrinsically. She brings into view two families who have different ideologies on beauty. She also portrays people at different age groups who try to achieve beauty and describes the meaning of beauty for each one in the novel. Smith is of the opinion that it is the intrinsic beauty that lets people forgive, like Kiki, be self-confident and strong like Carlene, is important. Audrey Hepburn also believed that the happiest girls are the prettiest girls. Online platforms like Instagram, Facebook and Twitter have paved way for women, especially the young ones to concentrate only on external features. With the increase in demand for beauty products, women are now considering it as a

very necessary part of their daily routine. The emergence of fairness and acne products has created an inferiority complex in the affected ones. Advertisements which market these products play a great role in making the viewer believe that external beauty is what matters. Being happy is the most effective and simplest way to look truly beautiful. In the Bible, in the book of Psalms says, “For you created my inmost being you knit me together in my mother’s womb. I praise you because I am fearfully and wonderfully made; your works are wonderful; I know that full well” (139.13-14). Smith, through the novel *On Beauty*, therefore, reminds the readers that it is not the outward appearances that matter; but the realisation of what you are as a human that matters the most.

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