Design & Construction of IOT Based Three Phase Power Fault Detection & Monitoring System with GSM Alert



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Declaration

It is declared hereby that this thesis paper or any part of it has not been submitted to anywhereelse for the award of any degree.

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This is to certify that this project entitled "**Design & Construction of IOT Based Three Phase Power Fault Detection & Monitoring System with GSM Alert**" is done by the following students under my direct supervision. This projectwork has been carried out by them in the laboratories of the Department of Electrical and Electronic Engineering under the Faculty of Engineering, Sonargaon University (SU) in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering.

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ABSTRACT

When one among the three-phases of a system gets lost, it may cause a phase loss. This type of loss is referred as a ‘single phasing’ and it is caused by a lightning strike, broken power line, or mechanical failure in switching equipment. This advanced system monitors the power failure. We have R, Y, and B as three phases, when there is a failure in one among the three phases this system alerts the authorized person through an SMS. This IOT based system is connected to the GSM module for configuration purpose. This system indicates the power failure by displaying the value of voltage on the LCD display. Then this system alerts the authorized person by informing about the disconnected phase through an SMS. When the power is re-connected to the system, it informs that the phase is working fine through a text message, to the authorized person’s mobile number. This is the way by which the authorized person gets notified about the power failure and he can take the necessary steps to solve the issue. The fault occurred in transmission line is very much dangerous for the locality. In locality the fault occurrence is more as compared to outer transmission line. In our prototype we design a model which is to be detect the fault in transmission line by comparing the voltage signal between the transmission line and a reference value, the reference value is predetermined and if the transmission line voltage is more than or less than reference value then fault is to be shown in display. The information regarding fault occurrence in particular phase is send to web page via IOT device which is NODE MCU(Esp8266) and also shown in display. The Voltage sensor is used to sense the voltage and send output to microcontroller IC. Here microcontroller IC ATMEGA 328P is used in this IC programming is done which compare the voltage signal and send output to IOT module and display. Similarly, climate is the condition of the environment, to the extent that it is hot or chilly, wet or dry, quiet or stormy, clear or overcast. Checking the

climate conditions physically is troublesome. Here on this paper the weather station is based totally on IoT (internet of things). Such a framework contains sensor like DHT11 that detects temperature and humidity. The sensor is associated with an e-bulletin board and ESP8266 board that is a low fee Wi-Fi module. By keeping the embedded devices in the environment for tracking enables us to know the college campus weather. The execution of the climate observing framework needs to convey the sensor gadgets in the surrounding for gathering the information and analysis.

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LIST OF ABBREVIATIONS

DC	Direct Current
AC	Alternating Current.
LCD	Liquid Crystal Display
ADC	Analog-to-Digital Converter
IR	Infrared Receiver
IC	Integrated Circuit
LED	Light Emitting Diode
PCB	Printed Circuit Board
LCD	Liquid Crystal Display

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CHAPTER I

INTRODUCTION

1.1 Introduction

When a line fault occurs in the three phase transmission line, a change occurs in the current and voltage at the point of fault that generates a high frequency. The fault impedance being low, the fault current is relatively high, during the fault and the Voltage becomes unbalanced. We found that IOT is very powerful and effective concept for today's scenario. This IOT based technology allows the devices to connect to the internet and helps in monitoring and controlling the devices from anywhere in the world. The number of internet users is rapidly increasing as the advancement in computers and smart phones are developing day-by-day. About 70 billion devices will be provided with internet service by the year 2023. The most important requirements are the reliability and the security of the system and to provide good quality and uninterrupted power supply to the consumers. Due to lack of monitoring the system's utility do not get timely data on the health of lines. Utility comes to, only when there is a serious damage/failure. The power flow towards the fault and supply to the nearby zone is affected [1]-[8]. IoT is the future innovation of associating the whole world at one place. Every one of the articles, things and sensors can be associated with sharing the information acquired in different areas and process/investigations that information for planning the applications like activity flagging, versatile wellbeing checking in therapeutic applications and mechanical security guaranteeing strategies, and so on. According to the estimation of innovative specialists, 50 billion articles will be associated in

IoT by 2020. IoT offers an extensive variety of network of gadgets with different conventions and different properties of utilizations for getting the total machine to machine cooperation.

1.2 Problem Statement

The problems that are caused due to the phase failure are listed below:

- It may damage the heavy and costly equipment.
- It leads to complete failure of the equipment and damage of the component internally.
- Severe conflicts may occur due to the unexpected phase failures.
- At the time of phase loss the equipment like motor, blower, pump etc. will draw excessive current that leads to overheating of motor windings.

1.3 Methodology

1. At first different data were collected from different sources such as books, internet etc.
2. Then the circuit was designed in protease software.
3. Then equipment's were collected from the market as circuit requirements.
4. The project was finally made.

1.4 Objectives

1. 3 Phase Line Fault Detection.
2. 3 Phase Line Fault Monitoring.
3. IoT Based Server Monitoring System.
4. GSM SMS Alert System.
5. Fire and Smoke Detection system.

CHAPTER II

THEORETICAL OVERVIEW

2.1 Introduction

The transmission line faults can interrupt the whole power distribution system. Power system operates in balanced condition under normal current & bus voltages. Fault can causes human death & other severe environmental damages. Three reasons causes the most of transmission faults- weather conditions, human error & equipment failure.

2.2 Common Faults in Power System

A defect in power system which causes stop flowing current is known fault.It can also be described as interruption of power. The faults can occur in power system –

Over current:

This occurs due to outflow current cause by short-circuiting or radiance release and sometimes due to the congestion of a supply system. Overcurrent relays are used to defeat this fault.

Under Voltage:

This occur on the line if the alternator field fails or the voltage drop across the machines is greatly increased. Under voltage, relays are used to overcome this fault.

Unbalance:

This occurs when two phases are earthed, or they are short-circuited or when one instrumentalist breaks. In such a state, different currents flow through different parts of the system.

Reversed power:

This only occurs in an interconnected system. When the generator's field fails, it

starts working as a motor and instead of giving power, it starts drawing it, that is, the power flow reverses due to which the generator might burn up. To prevent this from happening, reverse power relays are used.

Surges:

When lightning occurs, a severe fault takes place in the adjacent systems due to which short- lived waves of high currents and voltages are produced. Such a fault is known as surges. Lightning arrestors and over voltage relays are used to overcome this fault.

Open circuit:

This occurs in a system when a conductor breaks, due to which the reliability of a system is affected.

Short circuit:

This occurs due to failure of insulation, accidents, incorrect usage of system, human errors, internal or external errors or the shorting of overhead conductors. When such a fault occurs, as a result, heavy currents flow through one or more conductors, such a condition is known as short circuit. The resistance of the circuit is greatly decreased and heavy currents flow, these currents are known as short circuit currents. These currents are highly dangerous for the equipment. To prevent the equipments from damaging, protective gears, for example, fuses and circuit breakers are used to isolate the faulty section.

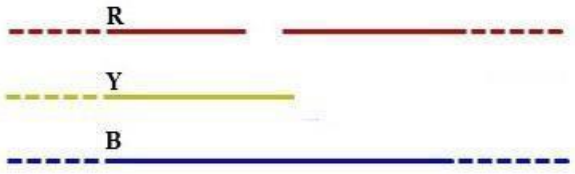
S.No	Type of Faults	Short Form	Symmetrical or Unsymmetrical	Probability of Occurrence
1	Three phase line to ground fault	3LG	Symmetrical	2 - 3%
2	Three phase line to line fault	3LL	Symmetrical	< 1%
3	Single line to ground fault	1LG	Unsymmetrical	70 - 80%
4	Line to line fault	1LL	Unsymmetrical	15 - 20%
5	Double line to Ground fault	2LG	Unsymmetrical	< 10%

2.3 Transmission Line Fault Types

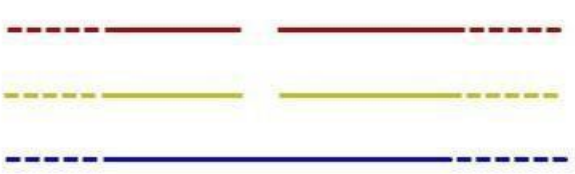
Open circuit Faults:

Causes: Broken conductor or malfunctioning of circuit breaker

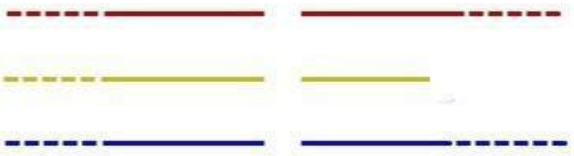
Effects: Insulation breakdown , Exceeding Voltage, Abnormal operation



(a). Single-phase open-circuit



(a). Two-phase open-circuit



(a). Three-phase open-circuit

Short Circuit Fault:

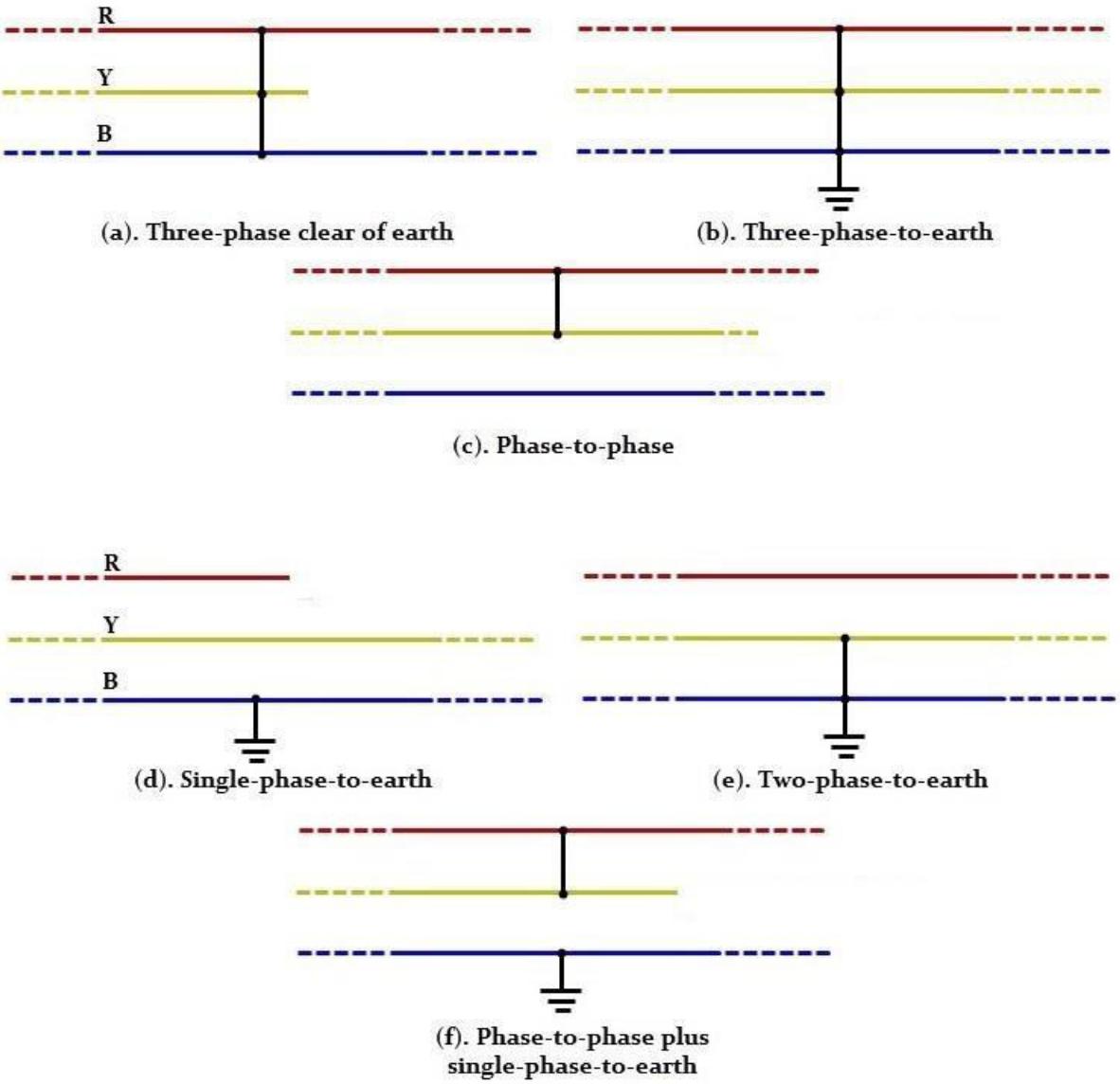
Causes: Internal effect breakdown , overloading , insulation breakdown

Effects: Arcing in faults can cause fire , load overheated, damage and reduction of lifespan Type:

i) phase to phase,

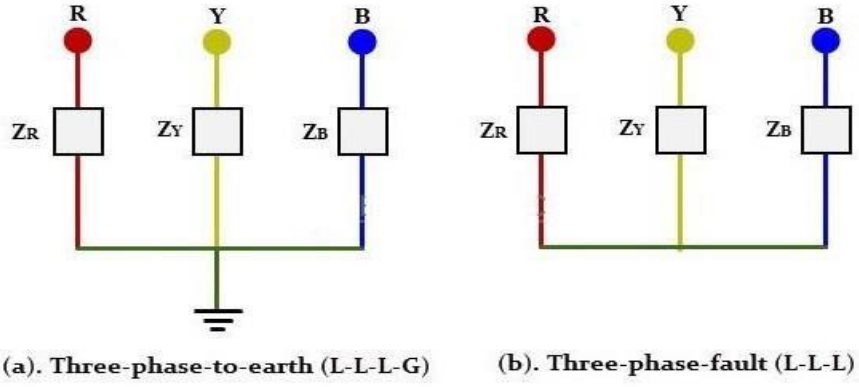
ii) phase to earth,

iii) phase to phase plus earth



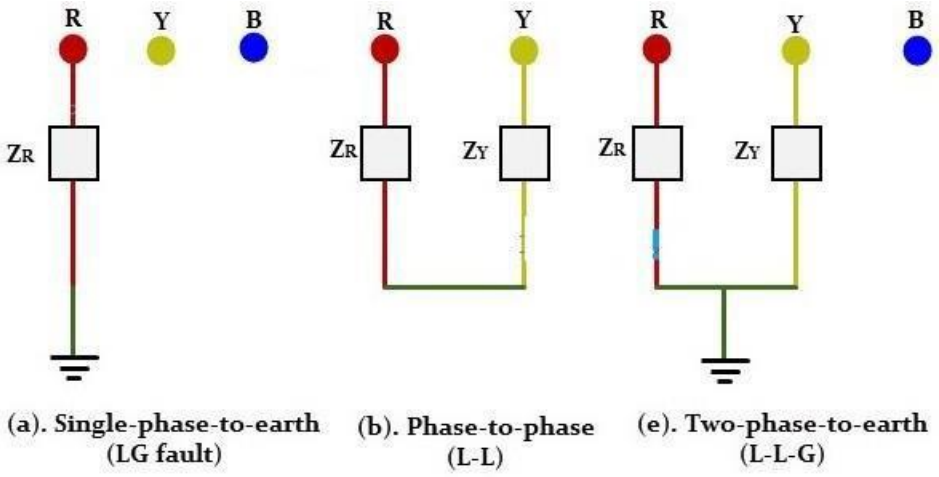
Symmetrical Faults

It is balanced fault.In this case all three phases are short circuited simultaneously.Its patterns are L-L-L & L-L-L-G



Asymmetrical Faults

It causes unbalanced current flows with different magnitude.This system is unsymmetrical.



2.4 Introduction of Project Materials

This chapter includes the total over view of the device. In this chapter we have followed-up the theory of the microcontroller, Transformer, GSM MODULE, sensor, describe of Microcontroller (8266 IoT), Vero board, and other components. Here we can know thatthe total system overview of the projects. And we will also know that how the equipment are working with each other.

2.4.1 ESP 8266 IoT Based Microcontroller

Node mcu is a microcontroller development board based on esp8266 that makes microcontroller easy to use.

The **ESP8266** is a low-cost Wi-Fi microchip, with built-in TCP/IP networking software, and microcontroller capability, produced by Espressif Systems[1] in Shanghai, China.

The chip was popularized in the English-speaking maker community in August 2014 via the **ESP-01** module, made by a third-party manufacturer Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and

make simple TCP/IP connections using Hayes-style commands. However, at first, there was almost no English-language documentation on the chip and the commands it accepted.[2] The very low price and the fact that there were very few external components on the module, which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, the chip, and the software on it, as well as to translate the Chinese documentation.[3]

The **ESP8285** is a similar chip with a built-in 1 MiB flash memory, allowing the design of single-chip devices capable of connecting via Wi-Fi.[4]

These microcontroller chips have been succeeded by the ESP32 family of devices.

Analog Pins – (A0)
Input/Output Pins – 14 (D0 - D10)
Operating Voltage – 5V
Input Voltage – 7.5~20V



Fig: ESP 8266 Microcontroller

2.4.2 IoT Communication

Internet of Things (IoT) devices communicate is dozens of different ways, using hundreds of different protocols. That's because how they communicate depends on what they are, where they are, what other devices and systems they need to talk to, and what they have to say. There’s no single best protocol, which is essentially the common "language" used to route messages from one IoT device to another. The right choice always depends on the application’s specific needs.There are also constraints to be considered. What's the device’s power budget? What are the cost limitations? What are the requirements for physical size, security, time to market, geographic regions and remote maintenance? In this article we'll take a look the embedded components of an IoT communication system, and discuss how different needs and contexts determine the best solution.

1. IoT device – anything from the tiniest temperature sensor to a giant industrial robot
2. Local communications – the method the device uses to speak with neighboring devices
3. Application protocol – the framework that defines how information content is transported
4. Gateways – translate and re-transmit information, typically linking local device networks to the Internet
5. Network servers – systems that manage the acceptance and transmission of IoT data, typically located inside cloud data centers
6. Cloud applications – process IoT data into useful information, for presentation to users
7. User interface – where people see IoT information, manipulate it, and issue commands back to IoT devices

2.4.3 LCD DISPLAY 16×2

A 16x2 display is used as shown in figure 4.2. It displays the status of the loads. It is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc. These displays are mainly preferred for multi-segment, light-emitting diodes, and seven segments.

The main benefits of using this module are inexpensive; simply programmable, animations, and there are no limitations for displaying custom characters, special and even animations, etc.



Fig: LCD Display 16×2

2.4.4 GSM Module (SIM 800L)

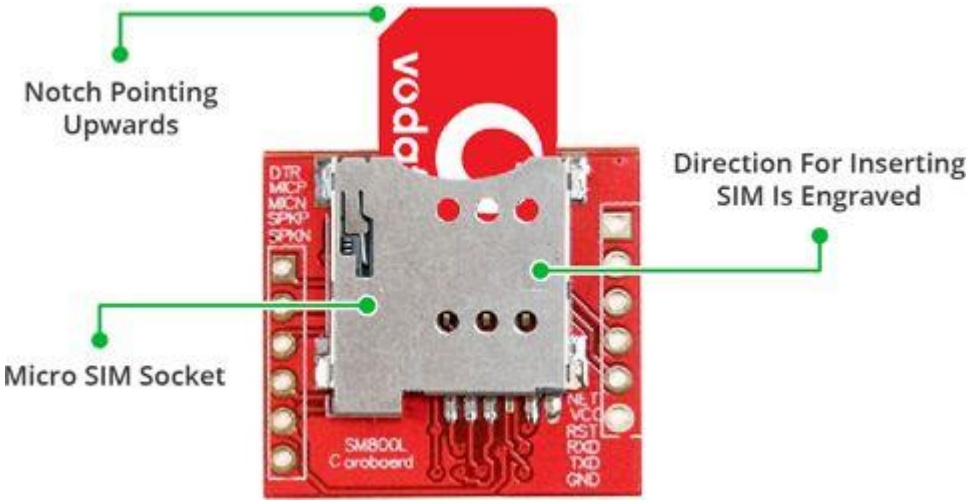
At the heart of the module is a SIM800L GSM cellular chip from Simcom.

The operating voltage of the chip ranges from 3.4V to 4.4V, making it an ideal candidate for direct LiPo battery supply. This makes it an excellent choice for embedding in projects with limited space.



All the necessary data pins of the SIM800L GSM chip are broken out to a 0.1″ pitch headers, including the pins required for communication with the microcontroller over the UART. The module supports baud rates ranging from 1200 bps to 115200 bps and features automatic baud rate detection.

The module requires an external antenna in order to connect to the network. So the module usually comes with a helical antenna that can be soldered to it. The board also has a U.FL connector If you wish to keep the antenna at a distance from the board.



There’s a SIM socket on the back! Any 2G Micro SIM card will work perfectly. The proper way to insert the SIM card is typically engraved on the surface of the SIM socket.

2.4.5 5V Relay

Relay is one kind of electro-mechanical component that functions as a switch. The relay coil is energized by DC so that contact switches can be opened or closed. A single channel 5V relay module generally includes a coil, and two contacts like normally open (NO) and normally closed (NC). This article discusses an overview of the 5V relay module & its working but before going to discuss what is relay module is, first we have to know what is relay and its pin configuration.

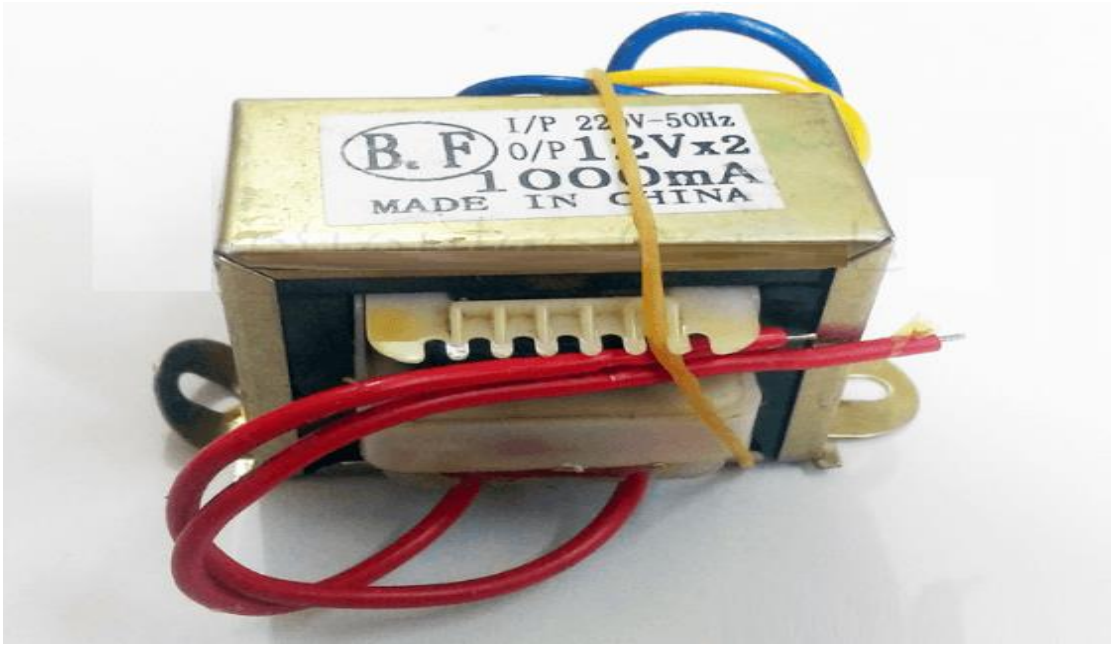
A 5v relay is an automatic switch that is commonly used in an automatic control circuit and to control a high-current using a low-current signal. The input voltage of the relay signal ranges from 0 to 5V.



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2.4.6 220/12 Volt Single Phase Transformer

- 12V 1000mA Transformer 12 0 12 1Amp Input AC 220V Output 12V Transformer 1A Transformer Step Down 12 0 12 Volt Transformers 1000mA For 12 0 12 Power Supply Adapters
- AC 220 V to DC 12 V 1A. This is a general purpose chassis mounting mains transformer. Transformer has 230 V primary windings and secondary winding. The transformer has flying colored insulated connecting leads. The Transformer act as step down transformer reducing 240 V AC to 12 V DC.



2.4.7 Bridge Rectifier

The bridge rectifier is made up of four diodes namely D_1, D_2, D_3 and D_4. The input signal is applied across the two terminals A and B while the DC output is obtained across the load resistor R_L connected between the terminals C and D.

The pulsating DC output obtained across the load resistor R_L contains small ripples. To reduce these ripples, we use a filter at the output.

The filter normally used in the bridge rectifier is a capacitor filter. In the below circuit diagram, the capacitor filter is connected across the load resistor R_L..

When input AC signal is applied, during the positive half cycle both diodes D_1 and D_3 are forward biased. At the same time, diodes D_2 and D_4 are reverse biased.

On the other hand, during the negative half cycle, diodes D_2 and D_4 are forward biased. At the same time, diodes D_1 and D_3 are reverse biased.

Thus, the bridge rectifier allows both positive and negative half cycles of the input AC signal.

The DC output produced by the bridge rectifier is not a pure DC but a pulsating DC. This pulsating DC contains both AC and DC components.

The AC components fluctuate with respect to time while the DC components remain constant with respect to time. So the AC components present in the pulsating DC is an unwanted signal.

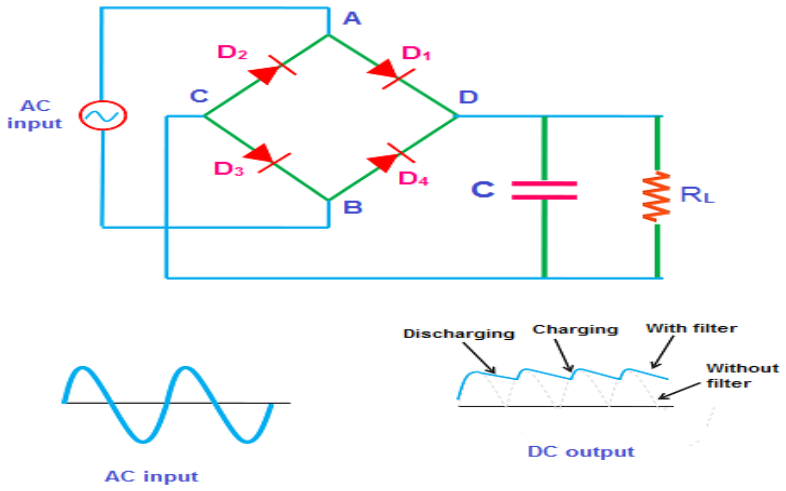
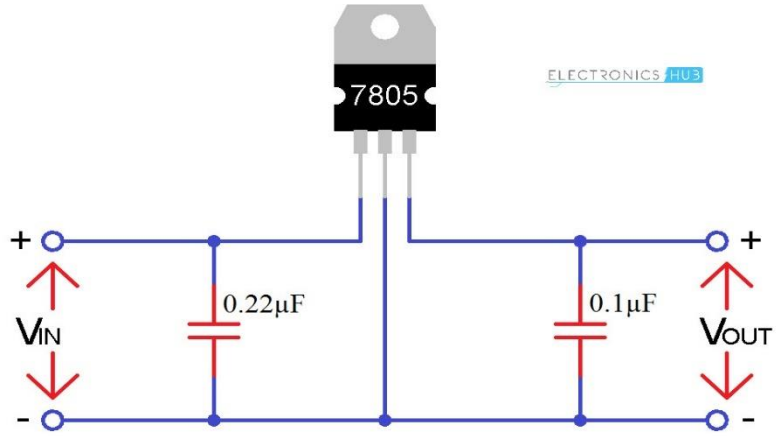


Fig: Bridge rectifier with filter

2.4.8 7805 Voltage Regulator IC

The name 7805 signifies two meaning, “78” means that it is a positive voltage regulator and “05” means that it provides 5V as output.



2.4.9 Fire Detector Sensor

The sensors in the flame detector will detect the radiation that is sent by the flame, the photoelectric converts the radiant intensity signal of the flame to a relevant voltage signal and this signal would be processed in a single chip microcomputer and converted into a desired output.



2.5 Gas or Smoke Detector

Gas sensors (also known as gas detectors) are electronic devices that detect and identify different types of gasses. They are commonly used to detect toxic or explosive gasses and measure gas concentration.



CHAPTER III

DESIGN & FEBRICATION

3.1 Introduction

In this chapter fully cover with discuss design and fabrication of this project. Here we will discuss about developed block diagram and briefly describe about the circuit description and also learn about working principle. Total project flow chart is also available in this chapter.

3.2 Block Diagram

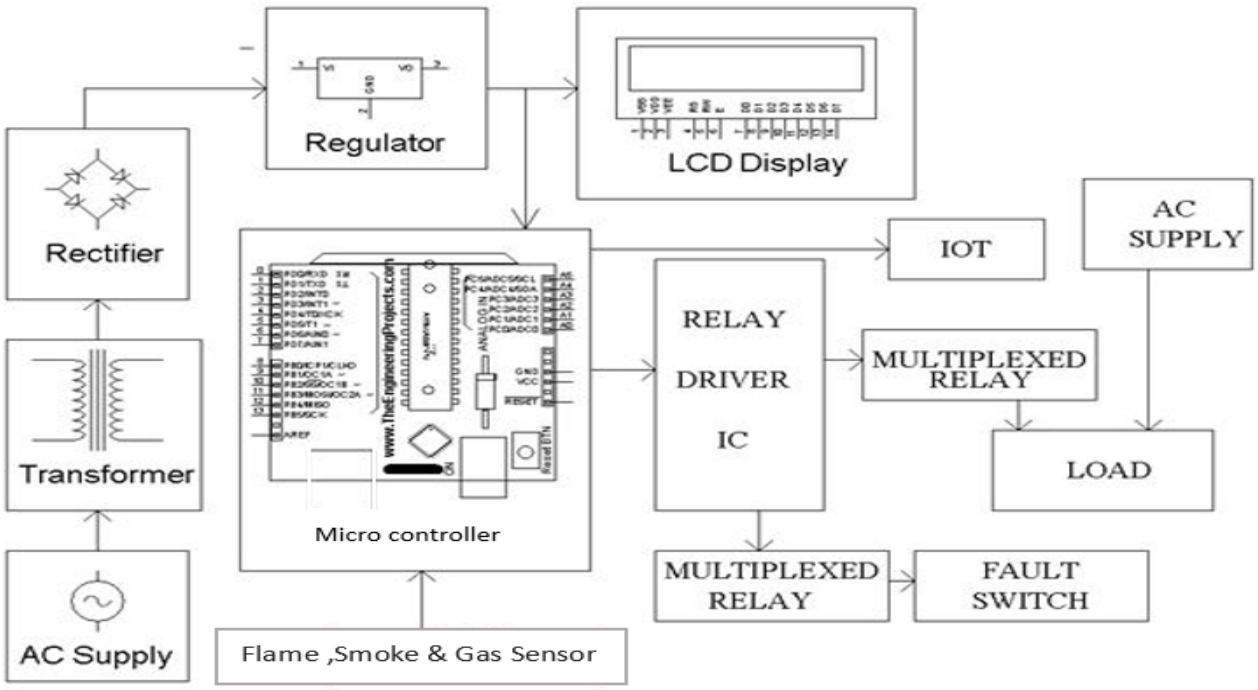
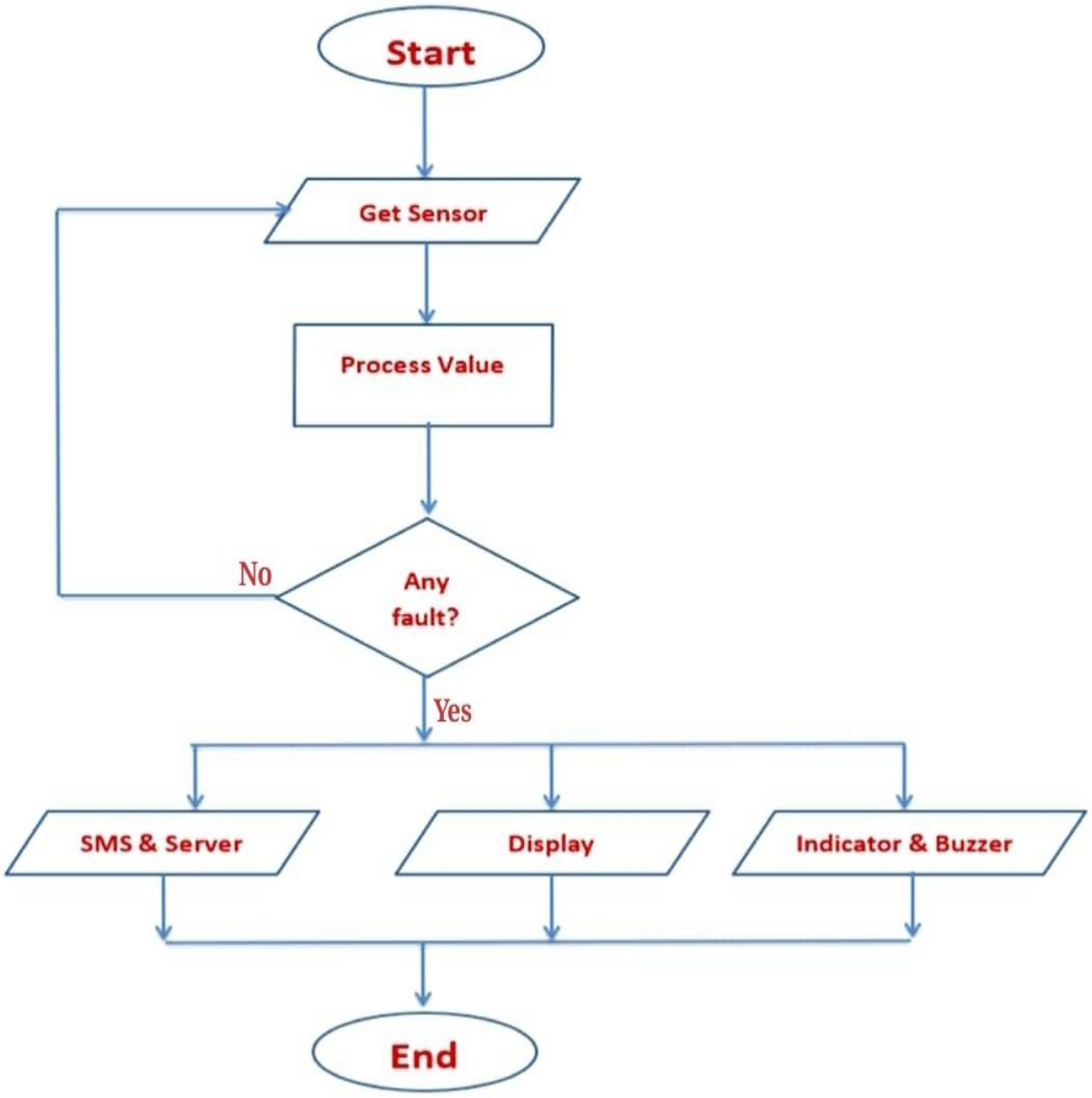


Fig: Block diagram of project

Here's the block diagram of our Microcontroller Based Integration of Renewable Energy system. We can clearly describe the working process through this block diagram. Firstly we have a power supply unit which provide to 5 volt dc power for 8266 microcontroller on .

3.3 Flow Chart



In this flowchart we can easily determine the working process of our system.

3.4 Circuit Diagram :

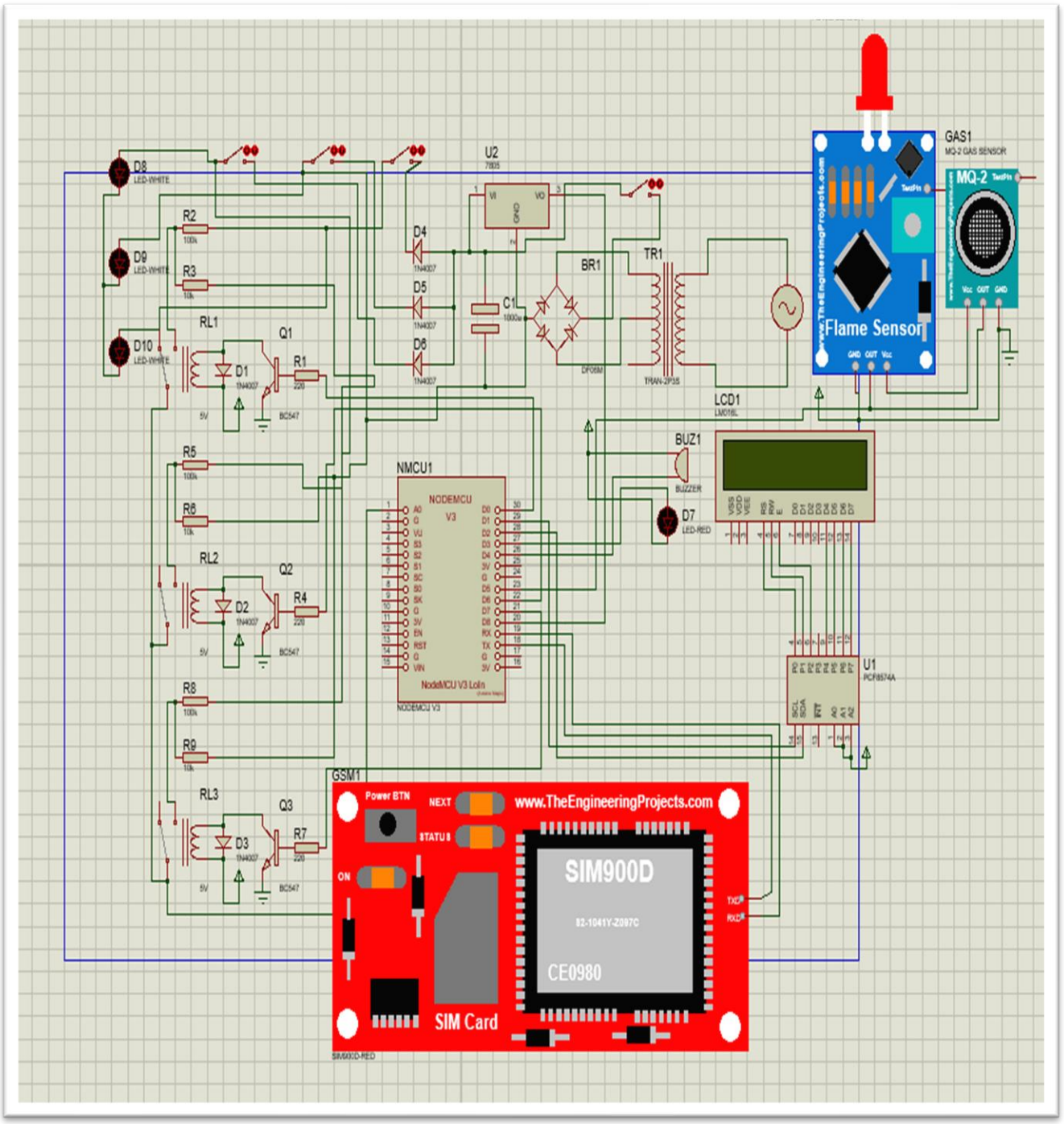


Fig: Circuit diagram of the Project

3.5 Overview of Using GSM system

GSM stands for **G**lobal **S**ystem for **M**obile Communication. It is a digital cellular technologyusedfor transmitting mobile voice and data services. Important facts about the GSM are givenbelow −

- The concept of GSM emerged from a cell-based mobile radio system at Bell Laboratories in theearly 1970s.
- GSM is the name of a standardization group established in 1982 to create a common Europeanmobile telephone standard.
- GSM is the most widely accepted standard in telecommunications and it is implementedglobally.
- GSM is a circuit-switched system that divides each 200 kHz channel into eight 25 kHztime-slots. GSM operates on the mobile communication bands 900 MHz and 1800 MHz in most parts of the world. In the US, GSM operates in the bands 850 MHz and 1900 MHz.
- GSM owns a market share of more than 70 percent of the world's digital cellular subscribers.
- GSM makes use of narrowband Time Division Multiple Access (TDMA) technique for transmitting signals.
- GSM was developed using digital technology. It has an ability to carry 64 kbps to 120 Mbps ofdata rates.
- Presently GSM supports more than one billion mobile subscribers in more than 210 countriesthroughout the world.
- GSM provides basic to advanced voice and data services including roaming service. Roaming isthe ability to use your GSM phone number in another GSM network.

  GSM digitizes and compresses data, then sends it down through a channel with two other streamsof user data, each in its own timeslot.

3.6 Working Principle

- There is a Step-down transformers; general purpose step down transformer connected to the main power supply. while the step down transformer is used to power up the circuit. General purpose the step down transformer has a 220V AC input and a 12V AC output. 12V AC output supply of the transformer is given to the diode bridge rectifier. The diode bridge rectifier is made up of four diodes. By providing a 12V AC input to the bridge rectifier; the rectifier gives a 12V pulsating DC output. The bridge rectifier's output is fed to a 1000µF capacitor, which converts pulsating DC to pure DC. The voltage regulator is used after the capacitor The voltage regulator gives a fixed 5V DC power supply as the microcontroller and display are powered by a 5V DC supply,. The regulator converts 12V DC to 5V DC. The Wi-Fi module operates on a 3.3V DC supply, to obtain 3.3V supply .3 diodes are connected in series.

1. First we need to turn on the power of the GSM module.
2. Then the power of the IoT Based Microcontroller should be turned ON.
3. Then 220/12 V, 1000mA transformer should be powered on Which will be used as 3 phase in our demo project through three partial relay contacts.
4. When the 3 phase power is ON, the display and server will show Line on with three lines on the line. For example: L1-on, L2-on, L3-on
5. When the 3 phase power main line is off, the display will show No Line, along with Fault Occurred Red Signal will be shown to the server via GSM and an SMS will be sent to the specified SIM number.
6. If a fault occurs in any one of the 3 phase lines, a red signal will be given to the server through IoT and an SMS will be sent to the specified number through GSM.
7. If any problem occurs due to fire or gas (Smoke) , the signal will go to the IoT server through Fire Detection Sensor & Smoke Direction Sensor and Fault Occurred SMS will be sent to specified number through GSM.

3.7 Real Image of Project :

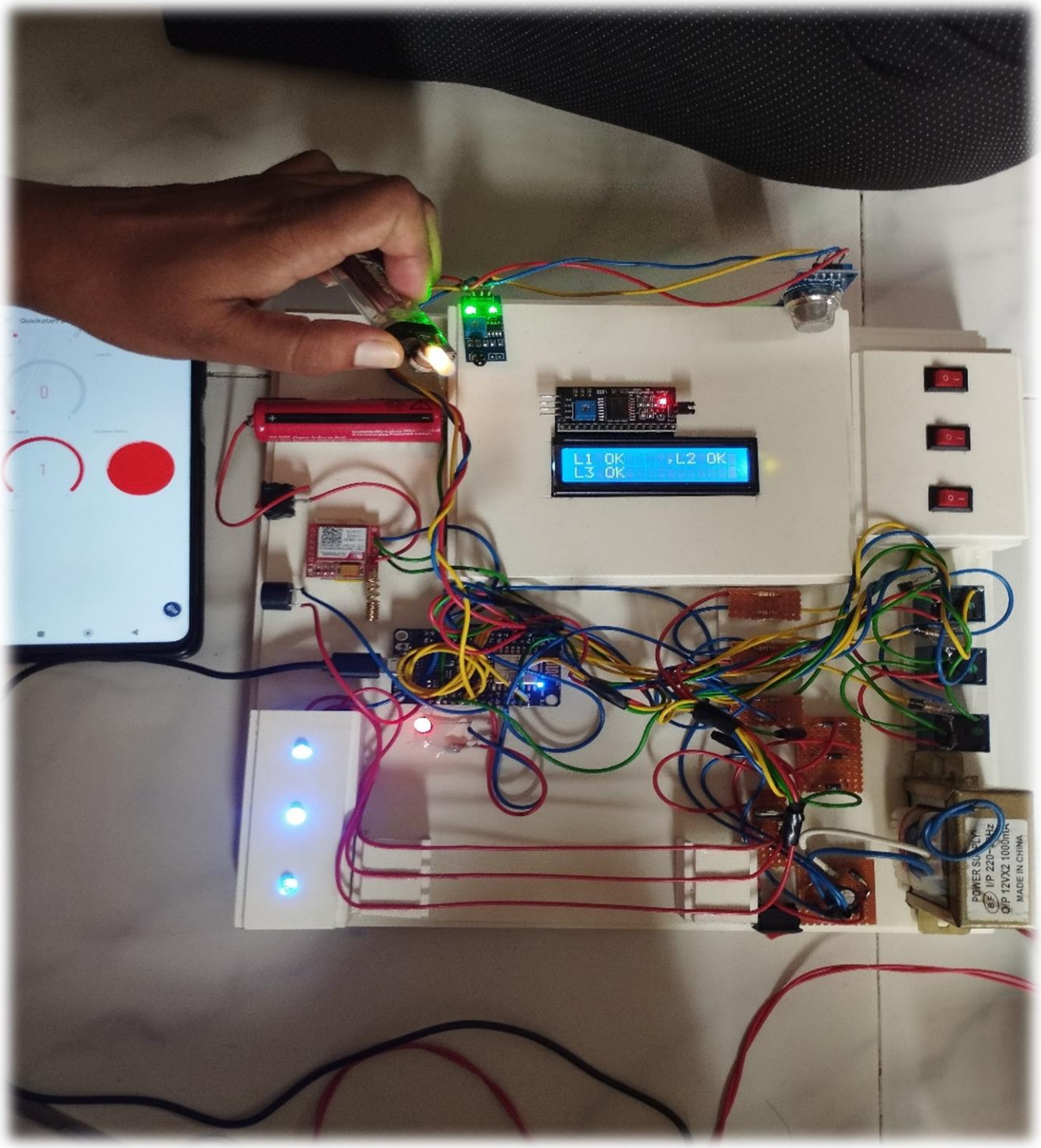


Fig: Real image of the project

CHAPTER IV

RESULT & DISCUSSION

4.1 Introduction

This chapter contains the results obtained and discussion about the project. We have also covered discussions about advantages, disadvantages and limitation of current version of the protection system.

4.2 Result

Primary On Condition 3Phase

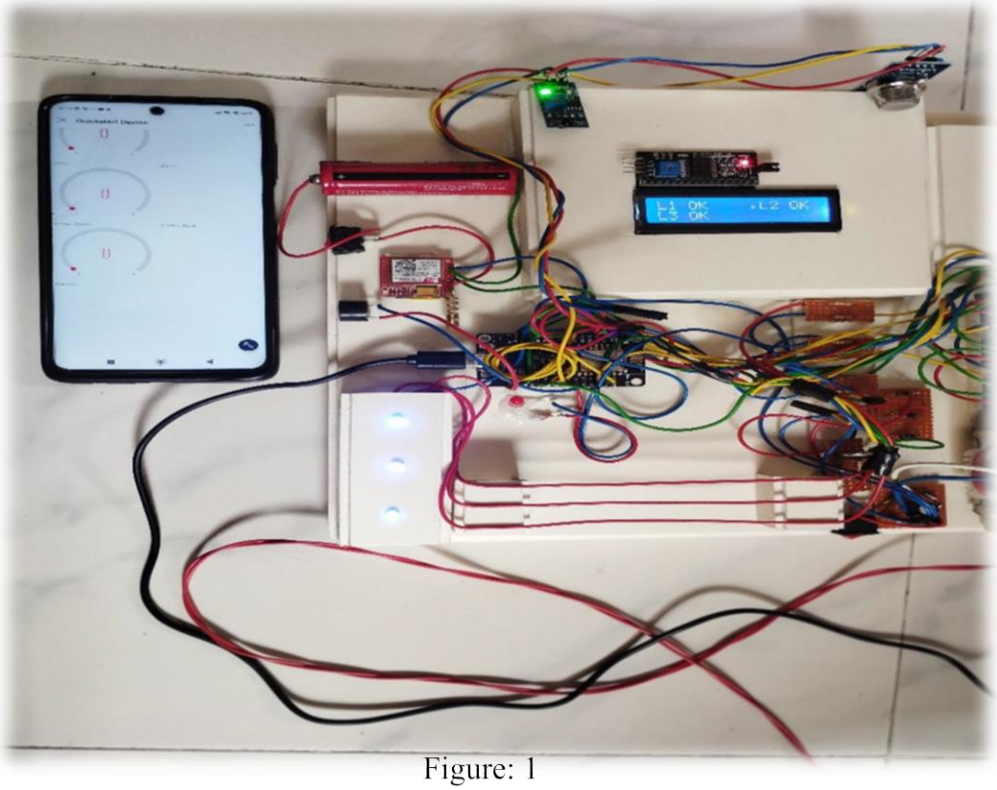


Figure: 1

Off Condition 3Phase (No Line)
Fault Showing The Server

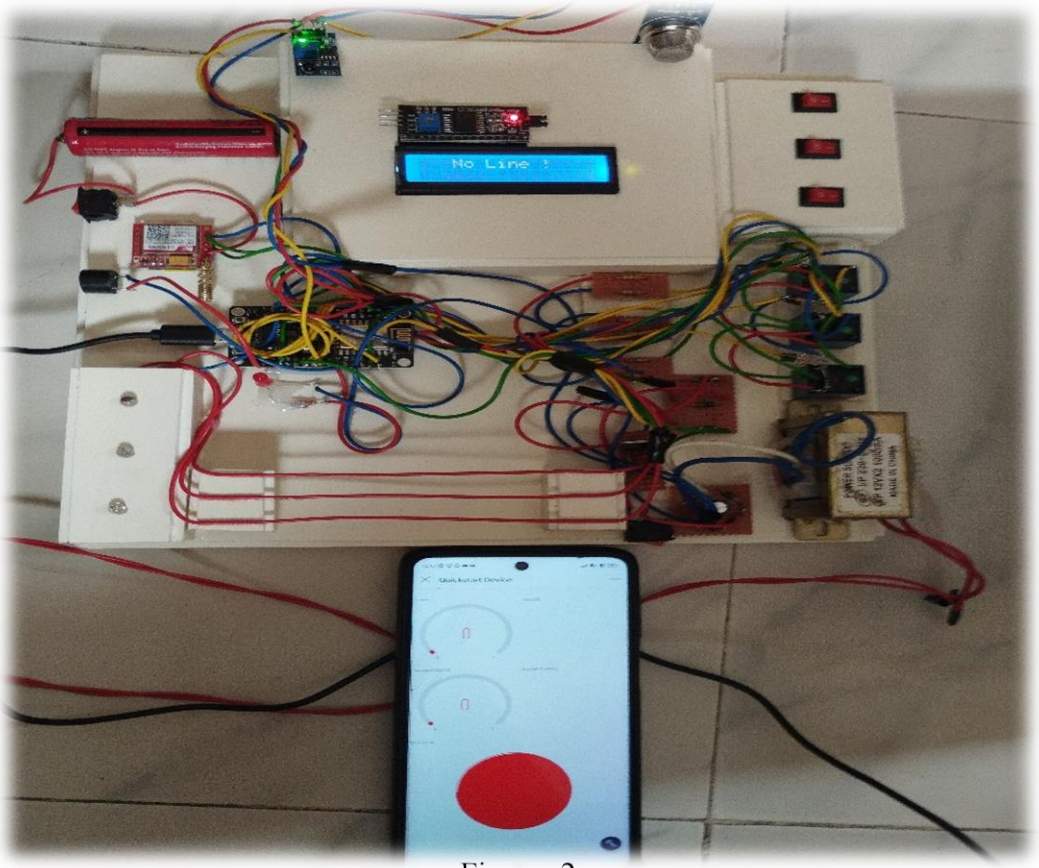


Figure: 2

Line 1 Problem Condition for 3Phase
Fault Showing The Server

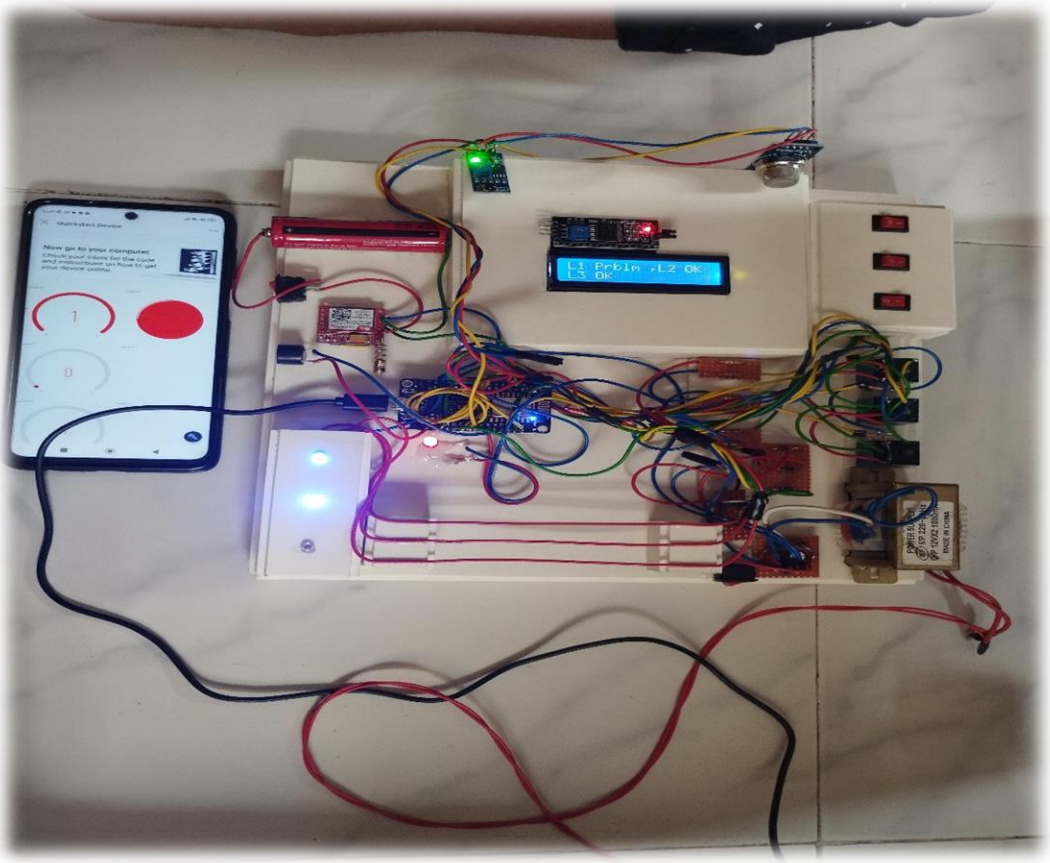


Figure: 3

Line 2 Problem Condition for 3Phase
Fault Showing The Server

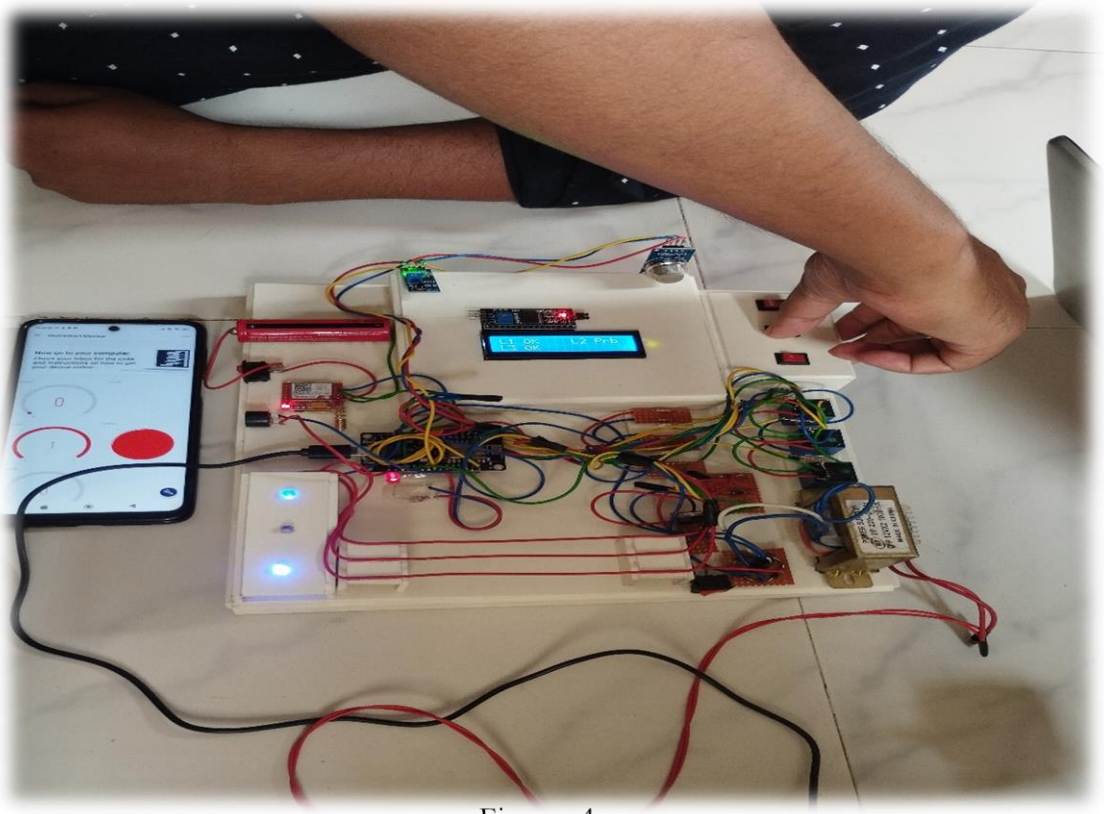


Figure: 4

Line 3 Problem Condition for 3Phase
Fault Showing The Server

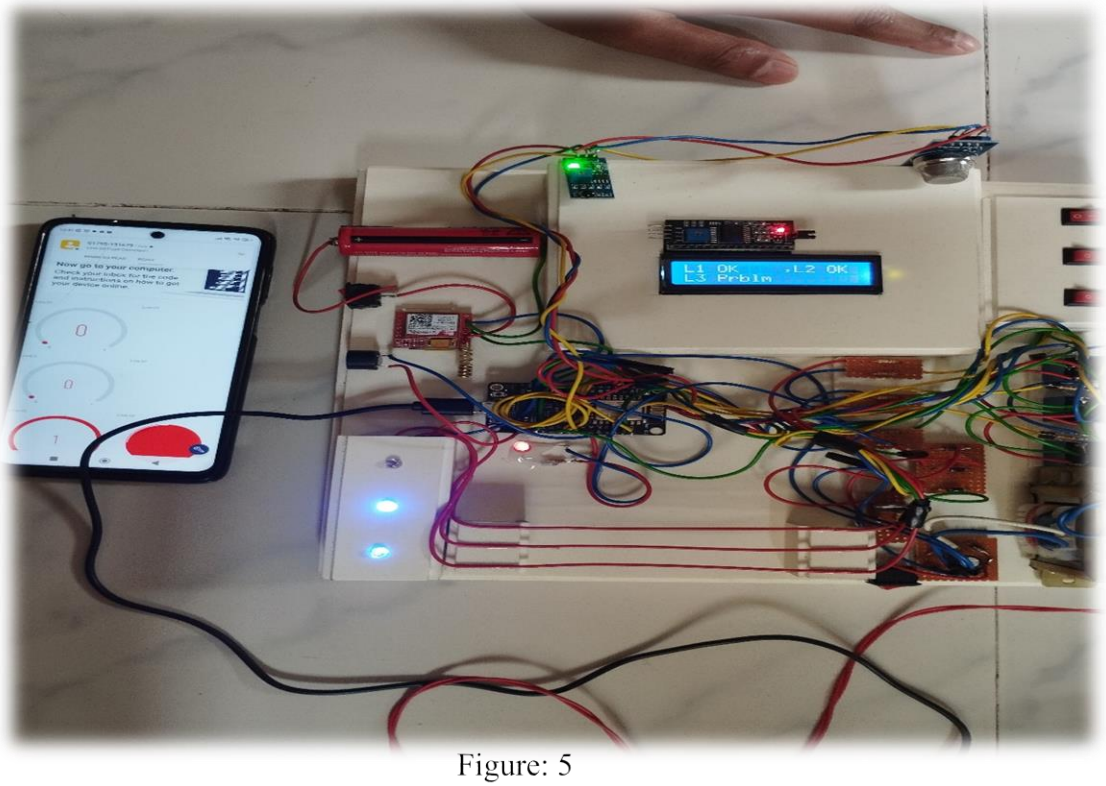


Figure: 5

Gas Leakage Detection
Fault Showing The Server

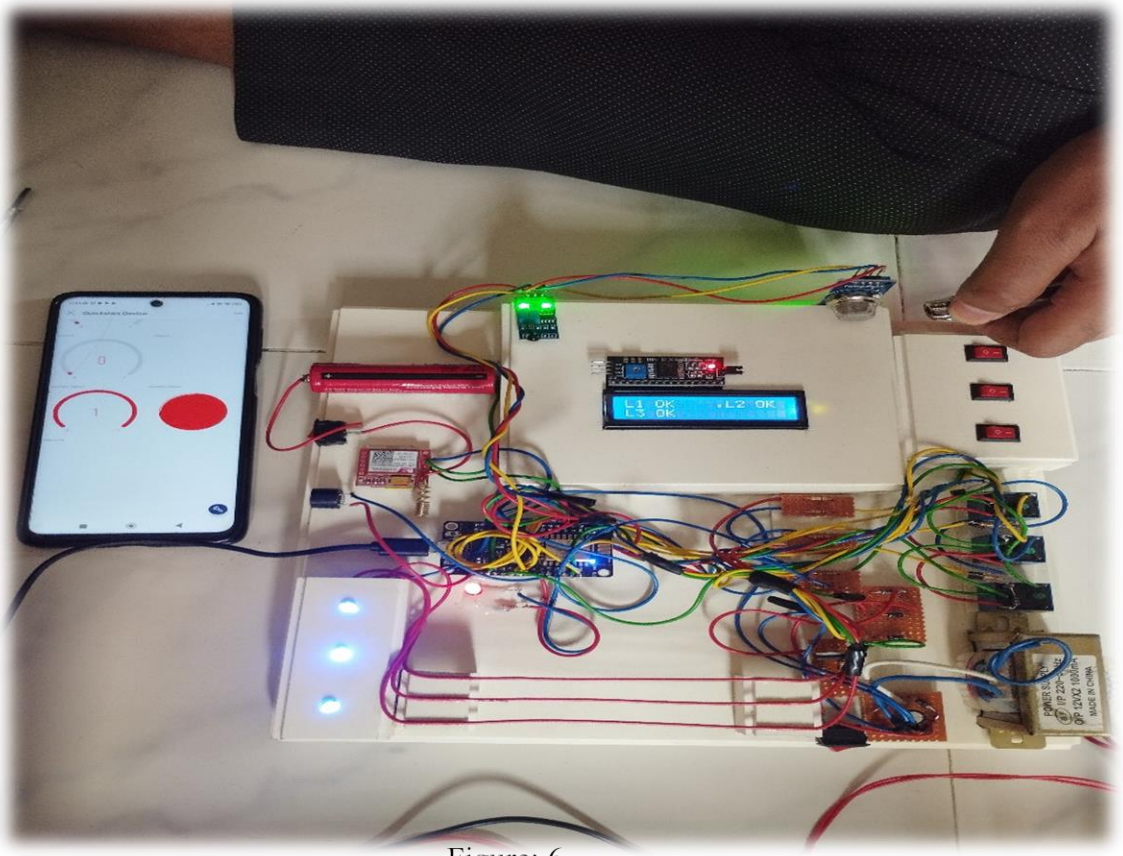


Figure: 6

Fire Detection
Fault Showing The Server

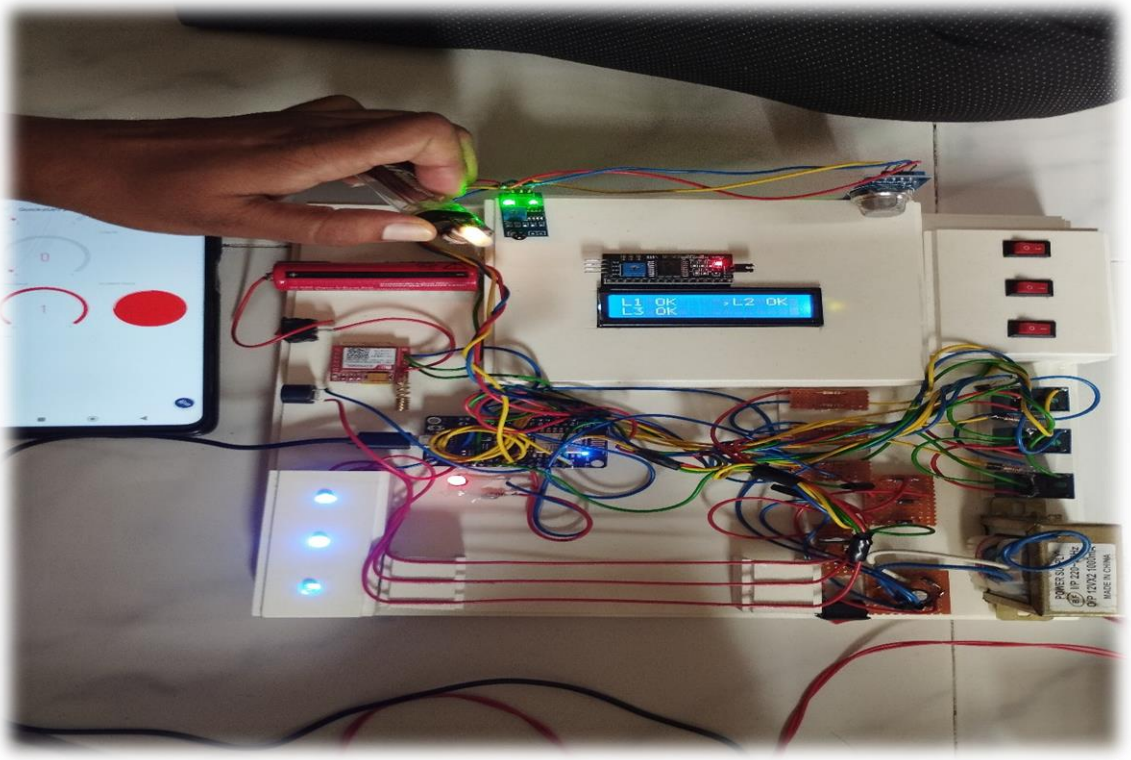


Figure: 7

4.3 Advantage of this Project

1. System cost is low compared to SCADA.
2. We can see the data through online communication.
3. Large number data aggregation.
4. Quickly Fault Founding.
5. Predictive analysis.
6. Time saving

4.4 Advantage of GSM Monitoring

1. More suitable network with robust features.
2. No roaming charges on International calls.
3. Worldwide connectivity and extensive coverage.
4. SAIC and DAIC techniques used in GSM provide very high transmission quality.

4.5 The following are some disadvantages of GSM:

- Electronic interference. Because GSM uses a pulse-transmission technology, it is known to interfere with electronics like hearing aids.
- Bandwidth lag.
- Limited rate of data transfer.
- Repeaters.

4.6 Applications

The developed system can be implemented in different applications of power transmission system. Power transmission faults can occurs any stage of power generation, transmission & distribution. The various abnormal circumstances such as natural disaster, equipment failure or disoperation can cause transmission line fault. It can be implemented in the following areas -

- Grid transmission line fault detection
- Distribution line fault detection
- Industrial power system monitoring
- Symmetrical & Asymmetrical fault monitoring

4.7 Cost Estimation

SL NO	Item Name	Specification	Unit	Unit Price	Total Amount
1	ESP 8266 IoT Based Microcontroller		1	810	810
2	Power Supply	12 volt , DC	1	140	140
3	Gas Detector	5 volt	1	210	210
4	Fire Detector	5 volt	1	60	60
5	GSM Module sim 800	SIM800	1	450	450
6	Board		1	280	280
7	Cable	0.5 MM	5M	30	60
8	Band Costape		1	200	200
9	Gun Gule stick		1	200	200
10	Two Plug		1	35	35
11	Signal Phase Transformer		1	300	300
13	Voltage Regulator	5 volt	1	120	120
14	Conveyance				200
				Total =	**3065**

4.8 Conclusion

In this project prototype is develop to detect power transmission line fault & identify its distance location. 8266 Microcontroller is used as main controller. Resistors are used to model line resistance. Buttons are used to create fault manually. Three phase system is developed by transmitting signal in certain interval in three power lines. Fault is created & satisfactory fault data is showed on 16x2 alphanumeric displays. The system continuously checks to get any fault signal. Then the fault signals are converted to analog signal for readability of Microcontroller input pins. Microcontroller process the incoming data & identify the fault type detection and Monitoring.

CHAPTER V

FUTURE WORK

5.1 Introduction

➢ This prototype can be used in Electrical Substations, Industries, and all the places where there is use of three-phase supply.

➢ Since this is based on IOT it can be used in smart cities as Internet connectivity is high in these areas which helps in quick fault detection and uninterrupted supply of power.

➢ This system can be used by high-power consumers as they can monitor the supply 24x7 through IoT platform and avoid major interruption in supply.

➢ The three phase power monitoring and failure alert system works to get the knowledge about the phase failure using IoT. The power failure among the three phases is reported to the cloud server. The need for uninterrupted power supply is increasing day by day. By using this system we can get to know about the failure in advance and take necessary actions to solve the issue. Arduino system is used to detect the power failure, alert the authority through an SMS, and LCD display connected with the microcontroller used to display the value of voltage and current. This can be implemented by sensors for failure detection, through the alert system using IoT.

References

1. Leibfried, T, “Online monitors keep transformers in service”, Applications in Power, IEEE, Volume:11 Issue: 3 , July 1998Page(s):36-42.

2. Chan, W. L, So, A.T.P. and Lai, L., L.; “Interment Based Transmission Substation Monitoring”, IEEE Transaction on Power Systems, Vol. 14, No. 1, February 1999, pp. 293-298.

3. Par S. Tenbohlen,T. Stirl, M. Rösner,” Benefit of sensors for on-line monitoring systems for power transformers”

4. T. D. Poyser, "An On-Line Microprocessor Based Transformer Analysis System to Improve the Availability and Utilization of Power Transformers". IEEE Trans. On Power Apparatus and Systems, Volume PAS-102, April 1983, pp.957-962.

5. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.Mckinlay, The 8051 Microcontroller And Embedded Systems Using Assembly And C, Second Edition, Pearson Education, 2008,India.

6. Microcontroller at mega 16; www.atmel.com/Images/doc2466.pdf

7. Constantin Daniel Oancea,” GSM Infrastructure Used for Data Transmission”, 7th International Symposium on Advanced Topics in Electrical Engineering (ATEE), 2011 May 12-14, Page(s): 1 – 4.

8. Abdul-Rahman AI-Ali, Abdul Khaliq & Muhammad Arshad,” GSM- Based Distribution Transformer Monitoring System”, IEEE MELECON 2004, May 12-15,2004, Vol 3Pages- 999-1002, Croatia.

Appendix

Program Code

```
#include <ESP8266WiFi.h>

#include <BlynkSimpleEsp8266.h>

char auth[] = BLYNK_AUTH_TOKEN;

char ssid[] = "abc";

char pass[] = "123456yx";

#include <SoftwareSerial.h>

#include <Wire.h>

#include <LiquidCrystal_I2C.h>

LiquidCrystal_I2C lcd(0x3F, 16, 2);

float input_voltage = 0.0;

float temp=0.0;

float r1=100000.0;//Bat +

float r2=10000.0;//gnd and junction for out

int analog_value=0;

int line1val=0;

int line2val=0;

int line3val=0;

int L1=D0;

int L2=D6;
```

```
int L3=D7;
int Mline=D8;
int MLval;
int accidentpin=D5;
int accidentval=0;
int buz=D4;
int led=D3;
void setup()
{
  // You can also specify server:
  //Blynk.begin(auth, ssid, pass, "blynk.cloud", 80);
  //Blynk.begin(auth, ssid, pass, IPAddress(192,168,1,100), 8080);
  // Setup a function to be called every second

  lcd.begin();
  lcd.backlight();
  lcd.setCursor(3, 0);
  lcd.print("Welcome To");
  lcd.setCursor(0, 1);
  lcd.print("   Our Project");
  delay(3000);
  lcd.clear();
```

```
  Serial.begin(9600);
  Serial.print("AT+CMGF=1\r"); //SMS text mode
  Blynk.begin(auth, ssid, pass);
 pinMode(L1,OUTPUT);
```