Fault detection system in Distribution Line using gsm and Arduino

A report submitted in partial fulfillment of the requirements for the Award of Degree of

Bachelor of Technology

In

Electrical Engineering

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ODISHA UNIVERSITY OF TECHNOLOGY AND RESEARCH, BHUBANESWAR-751029

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CERTIFICATE

This is to certify that the project report entitled "**Fault detection system in distribution line using gsm and Arduino**" submitted by Vaibhav Nanda *(* 1901106368*),* Sitanshu Sahoo (2021106030), Saswat lenka (1901106369) of the Department of Electrical Engineering, fulfils the requirement of the regulation relating to the nature and standard of the work for the award of the degree of Bachelor of Technology, in Electrical Engineering for academic year 2022-23.

Prof. (Dr) Ajit Kumar Barisal — **HOD, Electrical Engineering**

Dr. Meera Viswanandya — **Supervisor**

ଓଡ଼ିଶା ବୈଷୟିକ ଓ ଗବେଷଣା ବିଶ୍ୱବିଦ୍ୟାଳୟ
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DECLARATION

We do hereby declare that, the major project entitled, "**Fault detection system in distribution line using gsm and Arduino**" is a bona-fide work of study carried out by us under the guidance of Dr. Meera Viswanandya Department of Electrical Engineering, Odisha University of Technology and Research, Bhubaneswar. It has been prepared for the fulfilment of the requirements of the degree of 'Bachelor of Technology in Electrical Engineering'. The work has not been submitted for any other purpose.

PLACE: OUTR

DATE:

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ABSTRACT

Energy leakage is one of the major problems that the corporation faces in recent times. Controlling the leakage in electrical distribution lines that stretch millions of miles across the country is an exceedingly challenging task. The most viable solution to this problem would be to develop an automated mechanism capable of detecting any faults in the distribution lines and promptly notifying the relevant authorities of the exact location of the issue. Through this project you will develop a device that uses sensors to sense the incoming & outgoing values and detect anomalies. Furthermore, the system will be equipped with GSM module technology, allowing it to instantly notify the appropriate personnel of the location and extent of the leakage on an LCD screen in real-time. There are many courses of faults in power distribution leading to power outages, if not properly managed.

LIST OF ABBREVIATIONS

GSM	Global System for Mobile
SMS	Subscriber Identity Module
L-L	Line to line
L-G	Line to ground
CT	Current transformer
LED	light emitting diode

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INTRODUCTION

OVERVIEW:-

In Electrical power distribution system, the majority of voltage and current signal distortions in power distribution networks are brought on by fault. An interruption in power delivery may result from faults in power distribution lines. Because the system automatically and precisely gives accurate fault location information, the amount of time needed to find a defect is significantly decreased. This will guarantee a quicker reaction time from technical staff to fix these issues, protecting transformers from harm and disasters. The system uses a Arduino , LCD , Sensors and a GSM modem. The system uses an impedance-based algorithm approach to calculate the fault distance from the control room after automatically detecting, analyzing, and classifying problems. Finally, the control room receives the fault information. A distributed monitoring and centralized control system are designed and implemented in this project. SMS is sent to a responsible person's mobile device utilizing GSM wireless technology. A desirable solution for wireless communication applications is the GSM module. The GSM network offers dependable countrywide coverage for communications. Based on the GSM standard, short messaging service (SMS) is currently the service that is most widely utilized. A unique address (SIM card number) is provided to the remote control unit by the declining cost of GSM devices like mobile phones and the GSM SMS, allowing commands to be communicated across the wireless communication network.

LITRATURE REVIEW:-

Akshit Sharma*, Ankit Nirwan*, Ajay Singh Shekhawat [1] proposed “Fault Analysis on Three Phase Transmission Lines and its Detection” Power system failure could lead to instability loss and serious damage to either the defective or nearby healthy equipment

Sibisagar.B, Surya.V.R, VigneshVijayaraghavan, Dr.SuriyaKrishnaan [2] proposed. “Self-Regulating Line Fault Detection & Its Location In Transmission Lines “ Transmission line faults are one of the main causes of power outages and damage to power transfer equipment.

Prof. Vikramsingh R. Parihar1* , Shivani Jijankar2 , Anand Dhore3 , Arti Sanganwar4 , Kapil Chalkhure5., [3] proposed “Automatic Fault Detection in Transmission Lines using GSM Technology”

Sharmili W. Drugkar1 Krishna R. Maske2 Bhagyashree Gadekar3 [4] Proposed “TRANSMISSION LINE FAULT DETECTION USING GSM TECHNOLOGY” The distribution system and transmission system faults are sufficiently and precisely identified in this article using a smart GSM-based fault detection system.

PROBLEM STATEMENT :-

The present Proposed project is developed by reviewing different papers .In practical electricity, people use the trial and error method to detect the fault (Line to line fault / line to ground fault) of a distribution line. They feed supply at the single end at a time by dividing that distribution line into two parts and check the fault up to that section. These processes go on until they find the fault. After checking if they found anything, then it is ok to go forward. This process to find the fault and act accordingly takes time. The aim of this paper is reducing the time taken to detect a particular fault and alert the concerned authorities about the fault. There by providing optimum operation of electric power. The objective of this project is to provide with a simple way to detect the fault which will ultimately lead to optimum operation of the whole system and to improve the reliability of distribution network. To detect the accurate fault in the distribution lines, the sensor is used. The sensors sense the power characteristics of the distribution line.

CHAPTER 2

THEORY

BASICS:-

To attain our concept, need to use Arduino mega, voltage sensor, current transformer, astable multivibrator, buzzer, LCD, relays and gsm module. The project having these types of fault detectors –

1. Line to line and ground fault detection using low voltage cables. The transformer secondary will be star connected so that it will have a set of three phase lines. In order to conduct fault analysis, we utilize a compact circuitry known as a post unit, which is installed at multiple locations along the line. When there is short circuit between R-Y, Y-B phases then ADC get more than zero analog value at channel AD6 & AD7 where relay is in NO condition and load is stop running. The main unit also consists of set of sensors that give the status of line at that point and it accepts the information received from the post units. It sends information to the authorities of power provider about the fault including its type and location if it finds the line faulty and cutoffs the loads automatically from the lines and a notification will sent to a mobile phone using gsm.

2. Over load detection using current transformer. This is a circuit designed to detect over current. In this section a special type of CT is used to detect very low current. The output of this CT is an AC voltage proportional to the Load current. The CT voltage varies with load current. That output is connectd to the analog points of arduino A8, A9 and 10 and protects the load when the current is maximum.

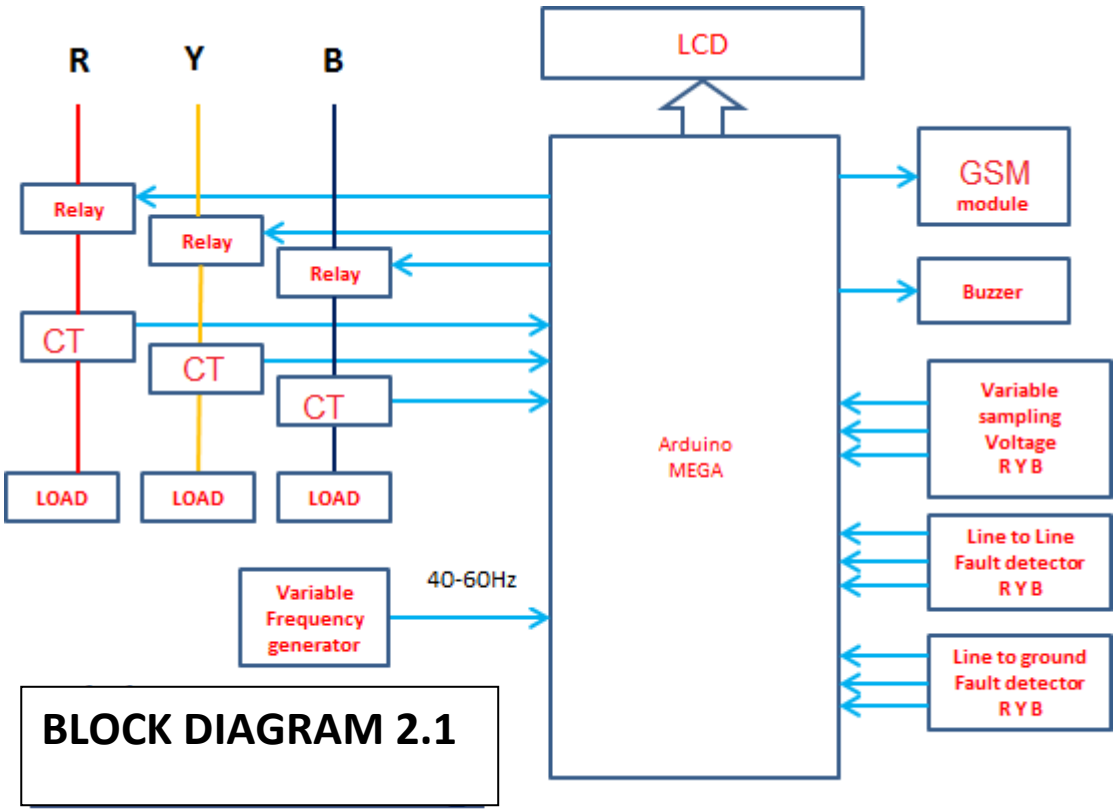
3. Over and Under voltage :- The use of a potentiometer allows for the detection of over and under voltage, which is then connected to the analog points of an Arduino to safeguard the load when the voltage reaches its maximum or minimum threshold. It is important to maintain the voltage within prescribed limits to ensure the satisfactory operation of all electrical and electronic devices. Voltage fluctuations caused by voltage surges, lightning, overload, and other factors can have detrimental effects on connected loads, resulting in over or under voltages. Exceeding the normal or rated voltage values can cause insulation damage to electrical appliances, leading to short circuits.

4. Frequency error detection – We have designed an oscillator having frequency 40 to 60 Hz using 555 timer and that output is given to the arduino pin - 8. Arduino measures the time between HIGH and LOW level of the signal and returns the value in microseconds. After adding the duration of both the times between HIGH to LOW and LOW to HIGH, inverse of this value will give the frequency of the signal. If frequency changes from 50hz to 60Hz or to 40Hz then suddenly it trip the loads using relays and send a notification to mobile phone.

APPARATUS REQUIRED :-

1. Arduino mega and gsm – 1
2. Current sensor – 3
3. Potentiometer – 4
4. 555 timer -1
5. Micro switches -3
6. RYB cable – 1meter each
7. Bulb holders – 6
8. Led bulb – 3watt – 3
9. 100watt bulb – 1
10. Buzzer – 1
11. 100 uf capacitor – 6
12. 10k resistor- 13
13. 10k preset – 3
14. Bc547 – 4
15. Relay 12v/7amp – 3
16. Diode in 4007 – 6

BLOCK DIAGRAM :-



BLOCK DIAGRAM 2.1

CIRCUIT DESCRIPTION :-

POWER SUPPLY:-

The basic requirement for designing a power supply is as follows,
1. The different voltage levels required for operating the devices. Here +5Volt required for operating microcontroller and other circuits etc.
2. The current requirement of each device or load must be added to estimate the final capacity of the power supply.

The power supply always specified with one or multiple voltage outputs along with a current capacity. As it is estimate the requirement of power is approximately as follows,
Out Put Voltage = +5Volt.
Capacity = 1000mA

The power supply is basically consisting of three sections as follows,

1. Step down section
2. Rectifier Section
3. Regulator section

TRANSFORMER :-

Project involves the use of several components, including a transformer (0-12 VAC, 1 Amp), IC 7805, diodes IN 4007, LED, and resistors. The circuit design starts with inputting a 230V, 50Hz AC signal to the primary side of the transformer. The secondary side of the transformer is connected to a bridge rectification diode, and the output of the diode is directed to the IC regulator (7805) via a 1000mf/35v capacitor. The output of the IC regulator is then connected to the LED through resistors.

GSM module :-

Global System for Mobile communication (GSM) is an architecture used for mobile communication in most of the countries. These devices, like mobile phones, need a SIM (Subscriber Identity Module) card to connect to the network. They also have an IMEI (International Mobile Equipment Identity) number, which serves as their identification. When a fault is detected ARDUINO mega send a signal to gsmmodule which then sends an SMS to the registerd number.

2.2 GSM

ELECTRIC BUZZER :-

It is a device that converts electrical signal to an audible signal (sound signal).The Microcontroller cannot drive directly to the buzzer, because the Microcontroller cannot give sufficient current to drive the buzzer for that we need a driver transistor (BC547), which will give sufficient current to the buzzer.Whenever a signal received to the base of the transistor through a base resistance (1.5k) is high, the transistor comes to saturation condition i.e. ON condition thus the buzzer comes to on condition with a audible sound. When the transistor's base does not receive a signal, it enters a state of cut-off i.e. is in OFF state thus the buzzer does not gets activated.

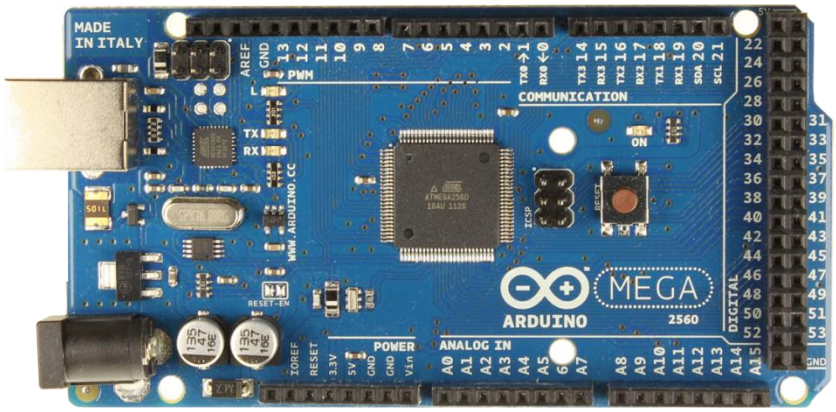
RELAY DRIVER :-

A BC547 transistor is used to design the relay driver. The relay specifications are as follows:
Coil resistance = 400 ohm
Coil voltage = 12Vdc
Contact capacity = 230V, 7A
Based on the specifications above, it can be inferred that the coil requires 12Vdc and 200mA of current. However, the Microcontroller can only supply up to 10mA of current, making a driver section necessary. The BC547 transistor has a typical current gain of 200 and a maximum current
capacity of 1A. This means that a typical base current of 200 μA is enough to trigger the relay on.

ARDUINO MEGA 265 :-

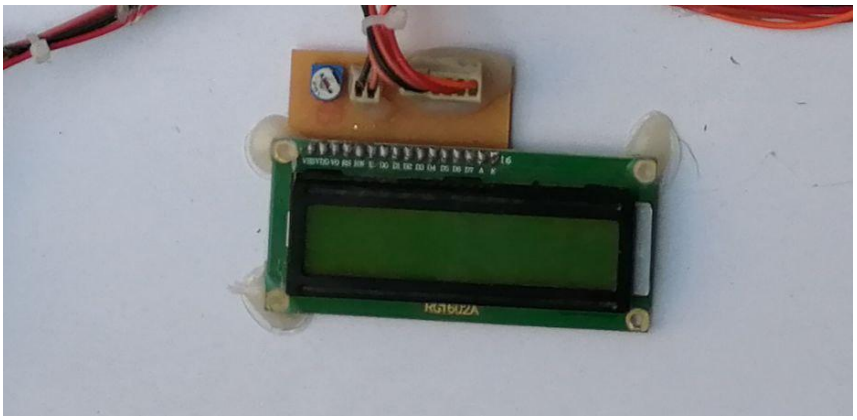
The ATmega2560-based microcontroller board, Arduino Mega 2560, is equipped with an array of features including 54 digital input/output pins, 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. With all the necessary components included, the board can be easily powered through an AC-to-DC adapter or battery, or connected to a computer via USB cable, making it convenient to get started.
OPERATING VOLTAGE – 5V
TOTAL DIGITAL PINS – 54

It is programmed using ARDUINO software.



2.3 ARDUINO

LCD :-

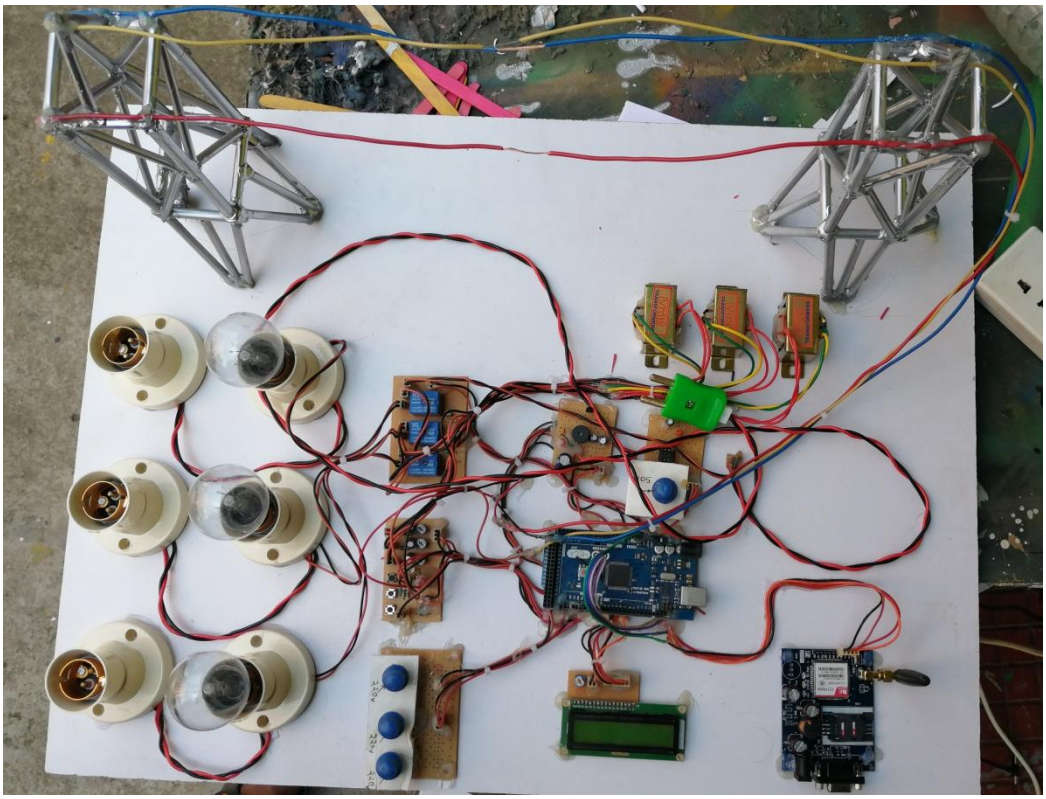


2.4 LCD

Typically, an LCD display requires a very low amount of energy to function, usually ranging from 5µA to 25µA at five volts per square inch.

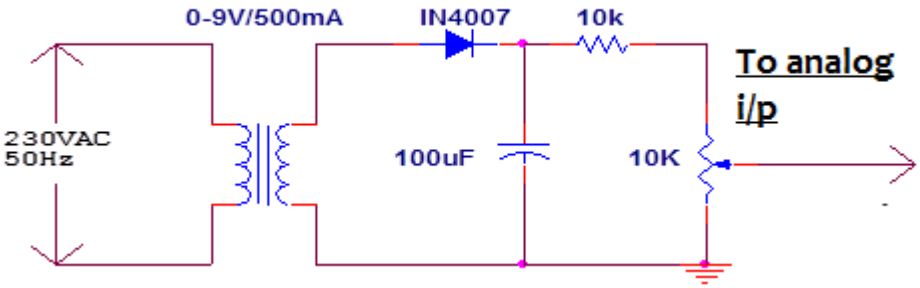
CHAPTER 3

WORKING



3.1 PROJECT

Under voltage/over voltage detection :-



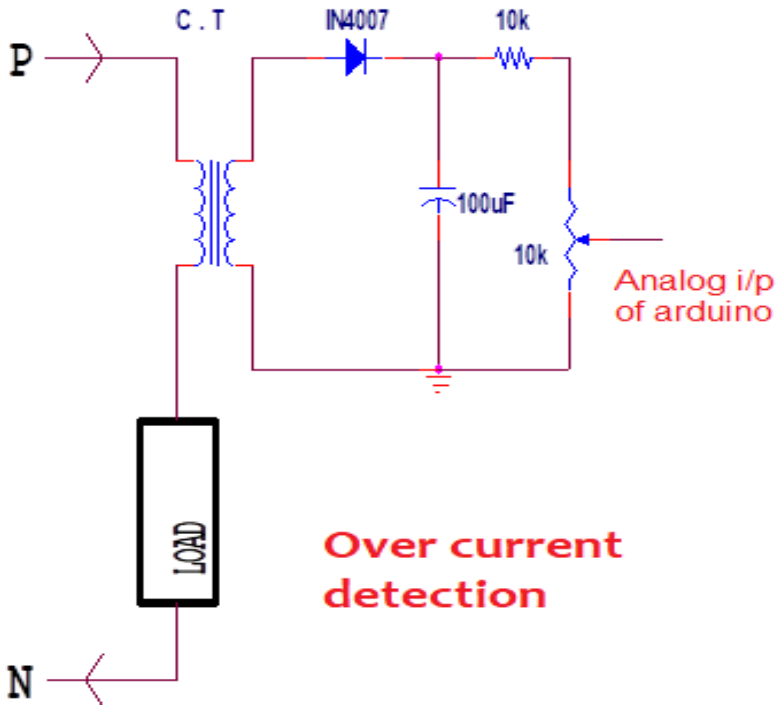
3.2 VOLTAGE DETECTION

The main voltage, which is at 230vac, needs to be reduced using a step down transformer. The output voltage of the transformer varies proportionally with the input voltage. The amount of flux induced in the transformer's primary winding determines the secondary

voltage. If the primary voltage increases, so does the secondary voltage, and vice versa. This causes under/over voltage situations.

The figure above depicts a half-wave rectifier that converts AC voltage to DC voltage. By adjusting the load resistance, we can control the voltage level, and by varying the load resistance RL, we can calibrate the sample voltage. The key to this design is accurately sampling the voltage as a replica of the line voltage. The step down transformer samples the line voltage at a reduced signal voltage. In the project we take the sample project between 0v-5v which apperantly representd 200v to 300v . By changing the variac the output voltage changes hence detectable by ARDUINO.

OVERCURRENT :-



3.3
OVERCURRENT

After passing through the half-wave rectifier, the DC voltage reaches approximately Vm. This voltage corresponds to the line voltage as a result of the capacitor charging. The circuit's time constant, which is defined by the product of the resistance and capacitance (RC), should be greater than five times the signal's time period (5T). When the RC value is less than 5T, the sampled voltage fluctuates unnecessarily. Conversely, when the RC value is too high, the sampling response becomes too slow. Here also when the output changes when we change the load connected with primary coil.

UNDER/OVER FREQUENCY :-

We have designed an oscillator having frequency 40 to 60 Hz using 555 timer and that output is given to the arduino pin - 8. Arduino measures the time between HIGH and LOW level of the signal and returns the value in microseconds. After adding the duration of both the times between HIGH to LOW and LOW to HIGH, inverse of this value will give the frequency of the signal. If frequency changes from 50hz to 60Hz or to 40Hz then suddenly it trip the loads using relays and send a notification to mobile phone.

LINE TO LINE / LINE TO GROUND :-

Low voltage cables are used for detecting line to line and ground faults. The secondary of the transformer is star connected to create a set of three-phase lines. A compact circuitry, called a post unit, is installed at multiple locations along the line to conduct fault analysis. If a short circuit occurs between R-Y and Y-B phases, the ADC (analog-to-digital converter) in channel AD6 and AD7 detects a value greater than zero while the relay is in the NO (normally open) state and the load stops running. The main unit comprises a set of sensors that report the line status at that point and receives information from the post units. If a fault is detected, the main unit sends information about the type and location of the fault to the power provider's authorities. It also automatically cuts off loads from the lines and sends a notification to a mobile phone via GSM.

CHAPTER 4

Code

```
//first gsm will be initialized, then welcome msg will show..after getting the gps value..gpslat n long value will show..
#include <LiquidCrystal.h>
#include <SoftwareSerial.h>
LiquidCrystal lcd(2,3,4,5,6,7); //rd,e,d4,d5,d6,d7
int sensor_pin = A11;
int voltageR = A0;
int voltageRvalue = 0;
int percentValueVR = 0;
int voltageY = A1;
int voltageYvalue = 0;
int percentValueVY = 0;
int voltageB = A2;
int voltageBvalue = 0;
int percentValueVB = 0;
int currentR = A8;
int currentRvalue = 0;
int currentRvalue1 = 0;
int currentRvalue2 = 0;
int currentY = A9;
int currentYvalue = 0;
int currentYvalue1 = 0;
int currentYvalue2 = 0;
int currentB = A10;
int currentBvalue = 0;
int currentBvalue1 = 0;
int currentBvalue2 = 0;
int rphaseG = A3;
```

```
int yphaseG = A4;
int bphaseG = A5;
int rphaseL = A6;
int bphaseL = A7;
int buzzer = 9;

const int relay1=10;
const int relay2=11;
const int relay3=12;            //integer for storing low time
float Ttime;            // integer for storing total time of a cycle
float frequency;        //storing frequency

void setup(){
Serial.begin(9600); // connect serial

pinMode(8,INPUT);
pinMode(buzzer,OUTPUT);
pinMode(rphaseG,INPUT_PULLUP);
pinMode(yphaseG,INPUT_PULLUP);
pinMode(bphaseG,INPUT_PULLUP);
pinMode(rphaseL,INPUT_PULLUP);
pinMode(bphaseL,INPUT_PULLUP);
digitalWrite(buzzer,LOW);
lcd.begin(16,2);
lcd.clear();
lcd.setCursor(0,0);
lcd.print("Initializing....");
delay(3000);
lcd.clear();
lcd.setCursor(0,0);
lcd.print("Getting Data....");
delay(2000);
```

```
}

void loop()
{
voltageRvalue = analogRead(voltageR);
voltageYvalue = analogRead(voltageY);
voltageBvalue = analogRead(voltageB);
currentRvalue = analogRead(currentR);
currentYvalue = analogRead(currentY);
currentBvalue = analogRead(currentB);
sw1=digitalRead(rphaseG);
sw2=digitalRead(yphaseG);
sw3=digitalRead(bphaseG);
sw4=digitalRead(rphaseL);
sw5=digitalRead(bphaseL);
lcd.clear();
Htime=pulseIn(8,HIGH);      //read high time
Ltime=pulseIn(8,LOW);       //read low time
Ttime = Htime+Ltime;
frequency=1000000/Ttime;    //getting frequency with Ttime is in Micro seconds
lcd.setCursor(0,0);
lcd.print("RYB frequency");
lcd.setCursor(5,1);
lcd.print(frequency);
delay(500);
if(frequency<40 )
{ digitalWrite(buzzer,HIGH);
lcd.clear();
lcd.setCursor(0,0);
lcd.print("Frequency error");
lcd.setCursor(5,1);
```

```
lcd.print(frequency);
Serial.print("Frequency error - ");
Serial.print(frequency);
delay(500);
digitalWrite(relay1,HIGH);
digitalWrite(relay3,HIGH);
digitalWrite(relay2,HIGH);
delay(300000);
digitalWrite(buzzer,LOW);
}
if(frequency>60 )
{ digitalWrite(buzzer,HIGH);
lcd.clear();
lcd.setCursor(0,0);
lcd.print("Frequency error");
lcd.setCursor(5,1);
lcd.print(frequency);
Serial.print("Frequency error - ");
Serial.print(frequency);
delay(500);
digitalWrite(relay1,HIGH);
digitalWrite(relay3,HIGH);
digitalWrite(relay2,HIGH);
delay(300000);
digitalWrite(buzzer,LOW);
}
lcd.clear();
percentValueVR = map(voltageRvalue,0,1023,180,250);
lcd.setCursor(0, 0);
lcd.print("Vr");
lcd.setCursor(1, 1);
lcd.print(percentValueVR);
```

```
if (percentValueVR<200) {
lcd.clear();
lcd.setCursor(0, 0);
lcd.print("Voltage error-Rph");
lcd.setCursor(0, 1);
lcd.print(percentValueVR);
digitalWrite(buzzer,HIGH);
digitalWrite(relay1,HIGH);
Serial.print("Voltage error in R phase - ");
Serial.print(percentValueVR);
delay(3000);
digitalWrite(relay2,HIGH);
digitalWrite(relay3,HIGH);
delay(300000);
digitalWrite(relay1,LOW);
digitalWrite(buzzer,HIGH);

}
if (percentValueVR>240) {
lcd.clear();
lcd.setCursor(0, 0);
lcd.print("Voltage error-Rph");
lcd.setCursor(0, 1);
lcd.print(percentValueVR);
digitalWrite(buzzer,HIGH);
digitalWrite(relay1,HIGH);
Serial.print("Voltage error in R phase - ");
Serial.print(percentValueVR);
delay(3000);
digitalWrite(relay2,HIGH);
digitalWrite(relay3,HIGH);
```

```
delay(300000);
digitalWrite(relay1,LOW);
digitalWrite(buzzer,HIGH);

}
percentValueVY = map(voltageYvalue,0,1023,180,250);

lcd.setCursor(5, 0);
lcd.print("Vy");
lcd.setCursor(5, 1);
lcd.print(percentValueVY);


if (percentValueVY<200) {
lcd.clear();

lcd.setCursor(0, 0);
lcd.print("Voltage error-Yph");
lcd.setCursor(0, 1);
lcd.print(percentValueVR);
digitalWrite(buzzer,HIGH);
digitalWrite(relay1,HIGH);
Serial.print("Voltage error in Y phase - ");
Serial.print(percentValueVY);
delay(3000);
digitalWrite(relay2,HIGH);
digitalWrite(relay3,HIGH);
delay(300000);
digitalWrite(relay1,LOW);
digitalWrite(buzzer,HIGH);

}
```

```
if (percentValueVY>240) {
lcd.clear();

lcd.setCursor(0, 0);
lcd.print("Voltage error-Yph");
lcd.setCursor(0, 1);
lcd.print(percentValueVR);
digitalWrite(buzzer,HIGH);
digitalWrite(relay1,HIGH);
Serial.print("Voltage error in Y phase - ");
Serial.print(percentValueVY);
delay(3000);
digitalWrite(relay2,HIGH);
digitalWrite(relay3,HIGH);
delay(300000);
digitalWrite(relay1,LOW);
digitalWrite(buzzer,HIGH);

}
percentValueVB = map(voltageYvalue,0,1023,180,250);

lcd.setCursor(10, 0);
lcd.print("Vb");
lcd.setCursor(10, 1);
lcd.print(percentValueVB);


if (percentValueVB<200) {
lcd.clear();

lcd.setCursor(0, 0);
lcd.print("Voltage error-Bph");
```

```
lcd.setCursor(0, 1);
lcd.print(percentValueVB);
digitalWrite(buzzer,HIGH);
digitalWrite(relay1,HIGH);
Serial.print("Voltage error in B phase - ");
Serial.print(percentValueVB);
delay(3000);
digitalWrite(relay2,HIGH);
digitalWrite(relay3,HIGH);
delay(300000);
digitalWrite(relay1,LOW);
digitalWrite(buzzer,HIGH);

}
if (percentValueVB>240) {
lcd.clear();

lcd.setCursor(0, 0);
lcd.print("Voltage error-Bph");
lcd.setCursor(0, 1);
lcd.print(percentValueVB);
digitalWrite(buzzer,HIGH);
digitalWrite(relay1,HIGH);
Serial.print("Voltage error in B phase - ");
Serial.print("  0.434");
delay(3000);
digitalWrite(relay2,HIGH);
digitalWrite(relay3,HIGH);
delay(300000);
digitalWrite(relay1,LOW);
digitalWrite(buzzer,HIGH);
```

```
}
delay (500);
lcd.clear();
currentRvalue1 =(currentRvalue);
 //currentRvalue2 = map(currentRvalue1,0,50,10,100);
 lcd.setCursor(0, 0);
 lcd.print("Ir");
 lcd.setCursor(0, 1);
 lcd.print(".002");

 if (currentRvalue1>500) {
 lcd.clear ();
 lcd.setCursor(0, 0);
 lcd.print("Over load-Rph");
 lcd.setCursor(0, 1);
 lcd.print("0.434   ");
 lcd.print(currentRvalue1);
 digitalWrite(buzzer,HIGH);
 digitalWrite(relay1,HIGH);
 Serial.print("Voltage error in B phase - ");
 Serial.print("  0.434");
 delay(3000);
 digitalWrite(relay2,HIGH);
 digitalWrite(relay3,HIGH);
 delay(300000);
 digitalWrite(relay1,LOW);
 digitalWrite(buzzer,HIGH);

 }
 currentYvalue1 = (currentYvalue);
 //currentYvalue2 = map(currentYvalue1,0,50,10,100);
 lcd.setCursor(5, 0);
```

```
lcd.print("Iy");
lcd.setCursor(6, 1);

lcd.print(".002");


if (currentYvalue1>520) {
lcd.clear ();
lcd.setCursor(0, 0);
lcd.print("Over load-Yph");
lcd.setCursor(0, 1);
lcd.print("  0.434   ");
lcd.print(currentYvalue1);
digitalWrite(buzzer,HIGH);
digitalWrite(relay2,HIGH);
Serial.print("Over Load in Y phase - ");
Serial.print("  0.434");
delay(3000);
digitalWrite(relay1,HIGH);
digitalWrite(relay3,HIGH);
delay(300000);
digitalWrite(relay1,LOW);
digitalWrite(buzzer,HIGH);

}
currentBvalue1 =(currentBvalue);
//currentBvalue2 = map(currentBvalue1,0,50,10,100);
lcd.setCursor(10, 0);
lcd.print("Ib");
lcd.setCursor(11, 1);

lcd.print(".002");
```

```
if (currentBvalue1>505) {
lcd.clear ();
lcd.setCursor(0, 0);
lcd.print("Over load-Bph");
lcd.setCursor(0, 1);
lcd.print("  0.434   ");
lcd.print(currentBvalue1);
digitalWrite(buzzer,HIGH);
digitalWrite(relay3,HIGH);
Serial.print("Over Load in B phase - ");
Serial.print(currentBvalue1);
delay(3000);
digitalWrite(relay2,HIGH);
digitalWrite(relay1,HIGH);
delay(300000);
digitalWrite(relay1,LOW);
digitalWrite(buzzer,HIGH);

}
delay (500);
if(sw1==LOW)
{

{
lcd.clear();

lcd.setCursor(0, 0);
lcd.print("  R PHASE");
lcd.setCursor(0, 1);
lcd.print("GROUND FAULT  ");
digitalWrite(buzzer,HIGH);
```

```
digitalWrite(relay1,HIGH);
Serial.print("Ground fault, R-Phase");
delay(3000);
digitalWrite(relay2,HIGH);
digitalWrite(relay3,HIGH);
delay(300000);
digitalWrite(relay1,LOW);
digitalWrite(buzzer,HIGH);
}
}

 if(sw2==LOW)
{

{
lcd.clear();
lcd.clear();
lcd.setCursor(0, 0);
lcd.print("  Y PHASE");
lcd.setCursor(0, 1);
lcd.print("GROUND FAULT  ");
digitalWrite(buzzer,HIGH);
digitalWrite(relay2,HIGH);
Serial.print("Ground fault, Y-Phase");
delay(3000);
digitalWrite(relay1,HIGH);
digitalWrite(relay3,HIGH);
delay(300000);
digitalWrite(buzzer,HIGH);
digitalWrite(relay2,LOW);
}
}
```

```
if(sw3==LOW)
{

{
lcd.clear();
lcd.clear();
lcd.setCursor(0, 0);
lcd.print("  B PHASE");
lcd.setCursor(0, 1);
lcd.print("GROUND FAULT  ");
digitalWrite(relay3,HIGH);
 digitalWrite(buzzer,HIGH);
Serial.print("Ground fault, B-Phase");
delay(3000);
digitalWrite(relay2,HIGH);
digitalWrite(relay1,HIGH);
delay(300000);
digitalWrite(buzzer,LOW);
digitalWrite(buzzer,HIGH);
}
}

 if(sw4==LOW)
{

 {
 lcd.clear();
 lcd.clear();
 lcd.setCursor(0, 0);
 lcd.print("R PHASE-Y PHASE");
 lcd.setCursor(0, 1);
```

```
 lcd.print("  LINE FAULT     ");
digitalWrite(buzzer,HIGH);
 digitalWrite(relay1,HIGH);
 digitalWrite(relay2,HIGH);
 Serial.print("Line fault, R-Y Phase");
 delay(3000);
 digitalWrite(relay3,HIGH);
 delay(300000);
 digitalWrite(buzzer,HIGH);
 }
 }
  if(sw5==LOW)
 {

 {
 lcd.clear();
 lcd.clear();
 lcd.setCursor(0, 0);
 lcd.print("Y PHASE-B PHASE");
 lcd.setCursor(0, 1);
 lcd.print("  LINE FAULT     ");
  digitalWrite(buzzer,HIGH);
 digitalWrite(relay3,HIGH);
 digitalWrite(relay2,HIGH);
 Serial.print("Line fault, Y-B Phase");
 delay(3000);
 digitalWrite(relay1,HIGH);
 delay(300000);
 digitalWrite(buzzer,HIGH);
 }
 }
 }
```

CONCLUSION :-

This project involves identifying faults and safeguarding three-phase loads. The project also includes displaying a message on an LCD and sending a notification to a mobile phone. An microcontroller is utilized to detect faults and to control the switching of relays. The relays are responsible for cutting off the power supply to all loads in the event of a short circuit. If a short circuit occurs between any two phases, the motor will trip based on the duration of the fault. This project has been developed and it has been found to operate satisfactorily under test conditions. The accuracy of the system is observed to be quite high.

FUTURESCOPE :-

The objective of this project is to immediately notify the service provider authority of any distribution line faults through a quick message system. The proposed model utilizes the distance between poles to determine the fault location. In the future, a GPS could be integrated to provide precise longitude and latitude coordinates of the fault. Additionally, suitable programming could be implemented to calculate the distance between the substation and the fault location.