EDL PROJECT REPORT ON

TRANSMISSION LINE FAULT DETECTION

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE

AWARD OF DEGREE OF BACHELOR OF

TECHNOLOGY

IN

ELECTRICAL ENGINEERING

SUBMITTED BY: -

Rohit Saini – 22006003

Nandita – 22006007

Anuj Sharma - 22006012

Ayush - 22006013

Anjum - 22006014

Shubham Chauhan - 23110004

SUBMITTED TO:-

Dr. Gurmanik Kaur

Head, EE, UIET,

SBBSU, Jalandhar

SANT BABA BHAG SINGH UNIVERSITY

DISTT. JALANDHAR, (PUNJAB)

(January 2025 – June 2025)

CANDIDATE'S DECLARATION

We hereby certify that the work which is being presented in the project entitled "TRANSMISSION LINE FAULT DETECTION" by Rohit Saini, Nandita, Anuj Sharma, Ayush, Anjum, Shubham Chauhan in partial fulfilment of requirements for the award of degree of Bachelor of Technology (Electrical Engineering) submitted to the department of Electrical Engineering at Sant Baba Bhag Singh University, Jalandhar is an authentic record of our own work carried out during the period from January 2025 to June 2025.The matter presented in this project has not been submitted to any other University/Institute for the award of Bachelor of Technology (Electrical Engineering) degree.

Rohit Saini – 22006003 Rohit Saini

Nandita – 22006007 Nandita

Anuj Sharma - 22006012 Anujsharma

Ayush - 22006013 Ayush

Anjum - 22006014 Anjum

Shubham Chauhan - 23110004 Shubham

This is to certify that the above statement made by the candidate's is correct to the best of my /our knowledge.

The B.Tech Project Viva-Voce Examination of this group has been held on 16/05/25 and accepted.

Signature of Internal Examiner

Signature of External Examiner

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Rohit Saini - 22006003

Ayush - 22006013

Nandita - 22006007

Anjum - 22006014

Anuj Sharma - 22006012

Shubham Chauhan - 23110004

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CHAPTER-1

INTRODUCTION

1.1 About Transmission Line Fault Detection

A Fault in electrical equipment is defined as a defect in its electrical circuit due to which the current is diverted from the intended path, resulting in an abnormal current flow. This abnormal current flow, also known as fault current, can damage equipment, cause power outages, and create safety hazards. Faults are generally caused by mechanical failure, accidents, excessive internal and external stresses etc.

The fault impedance being low, the fault currents are relatively high. During the faults, the power flow is diverted towards the fault and the supply to the neighboring zone is affected. Voltages become unbalanced. It is necessary to detect the fault as early as possible that is why a kit is being made using microcontroller to make its process faster.

The faults detected by project are symmetrical and unsymmetrical faults, line to line, line to ground, triple line to ground and will give trip signal to relay. The

Early fault detection allows for prompt intervention, reducing the risk of damage to equipment and the surrounding environment.

Transmission line fault detection projects have several important applications, including improving reliability, reducing downtime, enhancing safety, and enabling cost savings.

By detecting and isolating faults quickly, this project help ensure a stable and reliable power supply, minimizing disruptions to consumers and protecting equipment. The idea of the device designed is that it is used to detect the kind of fault that has occurred in a faulty line.

The main advantage of this circuit is that any lay man can use this circuit and can know the type of fault. It finds its applications at various medical hospitals, industries and places where high protection is needed for saving the costly equipments connected to the main line.

CHAPTER-2

BLOCK DIAGRAM & COMPONENTS

2.1 Block Diagram of Transmission Line Fault Detection

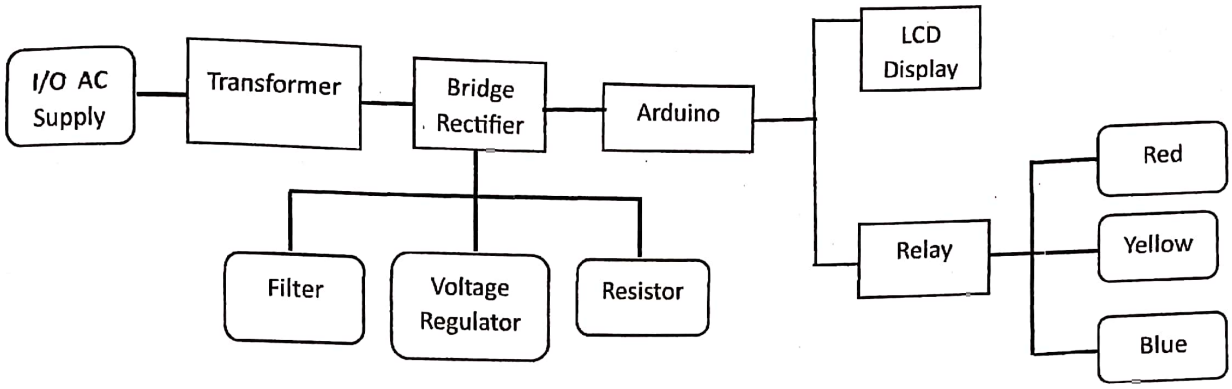

Fig. 2.1- Block diagram of Transmission Line Fault Detection System

2.2 COMPONENTS USED

- Arduino
- Electrical Transformer(12volt 1amp)
- 16*2 LCD Display
- Relay module (5Volt)
- Rectifier
- Capacitor
- Resistor
- 3 Bulb RYB(15watt)
- Connecting wire

2.3 DESCRIPTION OF COMPONENTS

2.3.1 Arduino

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board. The Arduino Uno R3 typically operates at 5V and has an I/O pin current limit of 20mA.

The Arduino hardware and software was designed for artists, designers, hobbyists, hackers, newbies and anyone interested in creating interactive objects or environments. Arduino can interact with buttons, LEDs, motors, speakers, GPS units, cameras, the internet and even your smart phone.

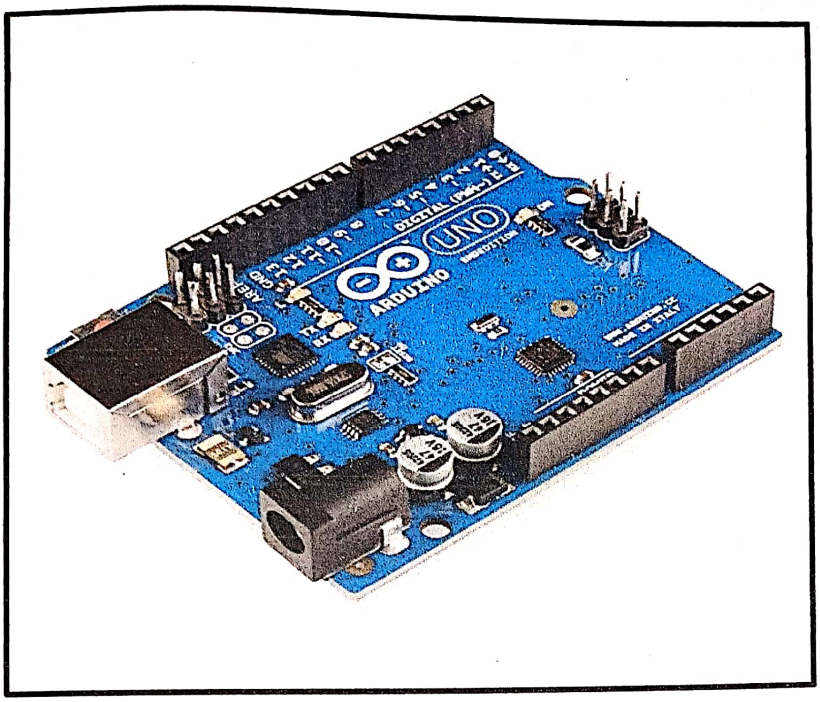

Fig.2.2:- ARDUINO

2.3.2. ELECTRICAL TRANSFORMER

A Transformer is an electrical device that takes a given input voltage and changes it to a different output voltage. This change can neither be an increase or a decrease in voltage. It is of 12V-1Amp (12-0-12) Transformer (230V to 12V).

A transformer is a device used in the power transmission of electric energy. The transmission current is AC. It is commonly used to increase or decrease the supply voltage without a change in the frequency of AC between circuits. The transformer works on the basic principles of electromagnetic induction and mutual induction.

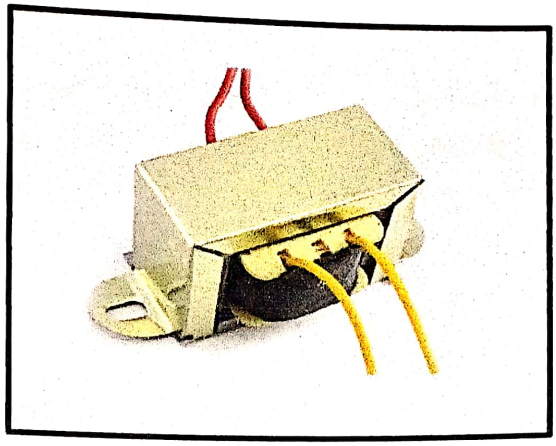

Fig. 2.3:- ELECTRICAL TRANSFORMER

TYPES OF TRANSFORMERS

1. Step-up Transformer

They are used between the power generator and the power grid. The secondary output voltage is higher than the input voltages. It typically operate with input voltages in the range of 220V, 415V and output voltages ranging from 33kV to 400 kV.

2. Step-down Transformer

These transformers are used to convert high-voltage primary supply to low-voltage secondary output. Step down 230V AC to 12V with a maximum of 1A current.

APPLICATIONS OF TRANSFORMERS

Transformers are used in a variety of applications, including power generation, transmission and distribution, lighting, audio systems, and electronic equipment.

- Power Generation: - Transformers are used in power plants to increase the voltage of the electricity generated by the plant before it is sent to the grid.
- Lighting: -Transformers are used in lighting systems to decreases the voltage of electricity before it is sent to light bulbs.
- Audio systems: -Transformers are used in audio systems to increase or decrease the voltage of electricity before it is sent to speakers.

2.3.3 16*2 LCD Display

A 16*2 LCD Display is very basic module and is very commonly used in various devices and circuits. A 16*2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5*7-pixel matrix.

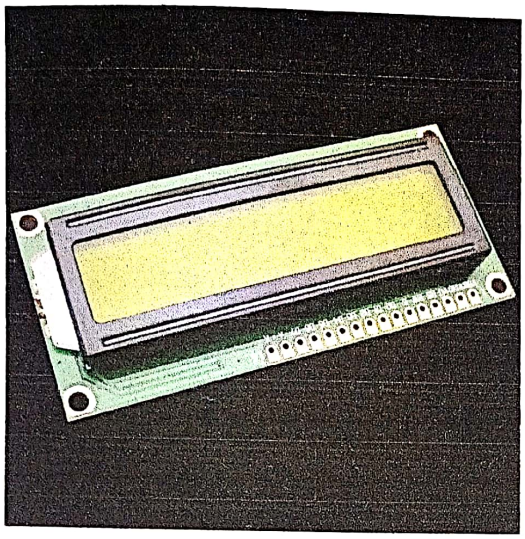

Fig:2.4 :-16*2 LCD Display

FEATURES OF 16*2 LCD DISPLAY

The features of the LCD mainly include the following: -

- The operating voltage of this LCD is 4.7V-5.3V.
- It includes two rows where each row can produce 16- characters.
- The utilization of current is 1mAh with no backlight.
- Every character can be built with a 5*8-pixel box.

2.3.4 RELAY MODULE

Relay modules are simply circuit boards that house one or more relays. They come in a variety of shapes and sizes but are most commonly rectangular with 2, 4, or 8 relays mounted on them, sometimes even up to 16 relays. It can be of 5V relay module for low power switching.

Relay module contains other components than the relay unit. These include inductor LEDs, protection diodes, transistors, resistors and other parts.

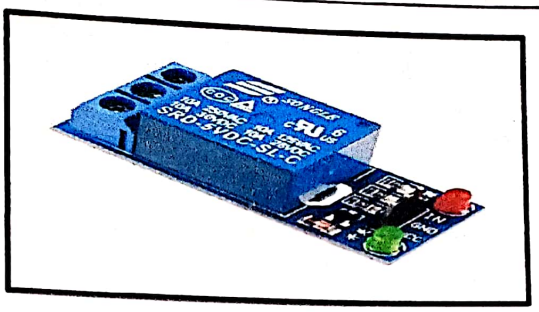

Fig. 2.5:- RELAY MODULE

2.3.5 RECTIFIER

A Rectifier is a device that converts Alternating current (AC) to Direct current (DC). This conversion is achieved by using diodes and other electronic components that allow current to flow in only one direction. The process of converting AC to DC is called rectification. It can handle up to 8amps of current and 1000volts..

Rectifiers utilize diodes, which act as one-way valves, to block the flow of current in one direction.

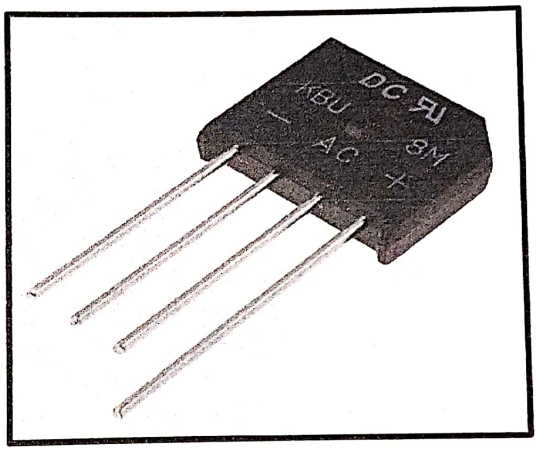

Fig. 2.6 :- RECTIFIER

2.3.6 CAPACITOR

A Capacitor is a two-terminal electrical device that can store energy in the form an electric charge. It consists of two electrical conductors that are separated by a distance. The space between the conductors maybe filled by vacuum or with an insulting material known as a dielectric. The ability of the capacitor to store charges is known as capacitance. In transmission

line fault detection, series capacitor are used to improve transmission line performance. Capacitor used are of 3300uf 25v.

Capacitors are used to smooth out voltage fluctuations and provide a stable output voltage.

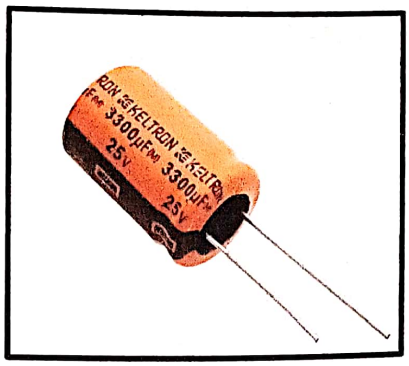

Fig. 2.7:- CAPACITOR

2.3.7. RESISTOR

A passive electrical component with two terminals that are used for either limiting or regulating the flow of electric current in electrical circuits. Neutral Grounding Resistors (NGRs) are used to limit fault currents.

The SI Unit of resistor is ohm.

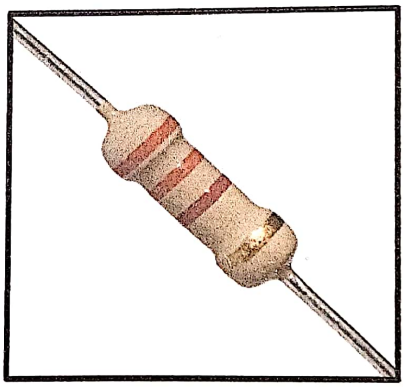

Fig.2.8:- RESISTOR

CHAPTER-5

PRECAUTIONS

5.1 Precautions

When detecting faults in transmission lines, several precautions must be taken to ensure safety, accuracy and system reliability.

- **Use Appropriate PPE (Personal Protective Equipment):**
  Gloves, Helmets, Insulated Boots etc.
- **Follow Lockout/ tagout procedures:**
  Ensure equipment is de-energized before physical inspection.
- **Maintain Safe Distance:**
  Especially near high voltage lines, use drones or remote sensors when possible.
- **Calibrate Detection Devices Properly:**
  Ensure relays, sensors and measurement tools are accurately tuned.
- **Check Grounding Systems:**
  Fault detection equipment should be properly grounded to avoid electric shocks.
- **Use Surge Protection Devices:**
  To safeguard detection equipment from voltage spikes.
- **Synchronize With Grid Operators:**
  Notify before running test or simulations that affect the grid.
- **Avoid Load Disturbances:**
  Ensure detection methods (like injecting signals) don't disrupt power delivery.
- **Redundancy in Protection Systems:**
  Use backup relays or fault recorders to ensure fault capture.
- **Ensure Accurate Time Stamping:**
  Use GPS or other time-sync method for event logging.
- **Monitor Communication Links:**

  Ensure SCADA or remote monitoring systems are functioning properly.

CHAPTER-6

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