Literature review

Earth Fault is an inadvertent fault between the live conductor and the earth. When earth fault occurs, the electrical system gets short-circuited and the short-circuited current flows through the system.

Earth Fault Protection Devices:

The devices give the tripping command to break the circuit when earth fault occurs.

Types of devices

## Earth Fault Relay (EFR)

It is a safety device used in electrical installations with high earth impedance. It detects small stray voltages on the metal enclosures of electrical equipment. The result is to interrupt the circuit if a

## Ground Fault Circuit Interrupter

The Ground Fault Circuit Interrupter is a safety device to prevent an electrical accident when any faulty tool is plugged in. It is a fast acting circuit breaker to shut down the supply when the earth fault occurs within 1/40th of a second. It compares the incoming and outgoing current from the equipment along the circuit conductor. If there is any difference as little as 5 mA, GFCI restricts the current and trip quickly.

## Earth Leakage Circuit Breaker:

The Earth Leakage Circuit Breaker detects the leakage current directly and prevents injury to humans and animals due to electrical shock

## Fault sensing:

Voltage-operated : detects a rise in potential between the protected interconnected metalwork and a distant isolated Earth reference electrode. They operate at a detected potential of around 50 volts to open a main breaker and isolate the supply from the protected premises

### Current sensing

typically consists of a current transformer, which has multiple primary windings and one secondary winding. Neutral and line (or lines in multiple phase systems) wires act as the primary windings. A wire wound coil is the secondary winding. The current through the secondary winding is zero at the balanced condition. In balance condition, the flux due to the current through the phase wire will be neutralized by the current through the neutral wire, since the current, which flows from the phase will be returned to the neutral. When a fault occurs, a small current will flow to the ground also. This makes an unbalance between line and neutral current and that creates an unbalanced magnetic field. This induces a current through the secondary winding, which is connected to the sensing circuit. This will sense the leakage and send signal to tripping system

processing:

A transformer and rectifier are used to obtain a DC reading that can be used in the relays .

THE readings are then passed to a decision-making circuit that checks the readings for a passible fault and acts according to that

## decision making circuit

using a differential or operational amplifier to process the fault and then pass the result into a relay that turns off the circuit until an action is taken

## Preliminary design