

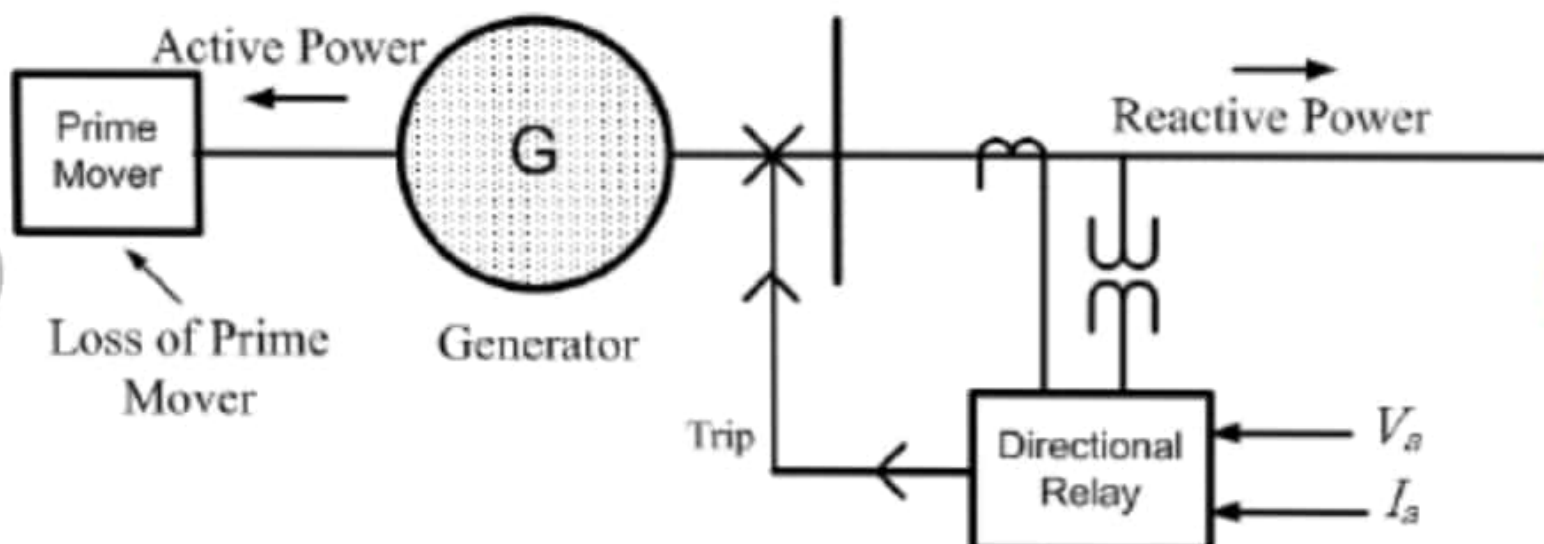
. What are the functions of protective relaying?

(A/M-07)

A fault in the equipment in the supply system leads to disconnection of supply to a large portion of the system. If the faulty part is quickly disconnected, the damage caused by the fault is minimum and the faulty part can be repaired quickly and the service can be restored without further delay. Better service continuity has its own merits. Thus the protective relaying helps in improving service continuity.

Some of the possible causes of faults are,

- Overvoltage due to switching surges
- Severe lightning strokes
- Aging of conductor
- Heavy wind, rains, and snowfall
- Falling trees on the transmission line
- Excessive internal and external stresses on the conductors
- High changes in atmospheric temperatures
- Accident of vehicle with towers or poles of transmission line
- Perching of birds on the lines
- Accidental short circuit due to string, snakes
- Chemical pollution



A relay is connected to 400/5 ratio current transformer with a current setting of 150%. Calculate the plug setting multiplier when the circuit carries a fault current of 4000 A.
(N/D-11)

Given:

Current transformer turns ratio	= 400/5
Current setting	= 150%
Primary fault current	= 4000 A

To find:

Plug setting multiplier (PSM)

Formula:

$$\text{PSM} = \frac{\text{Primary current (fault current)}}{\text{Relay current setting} \times \text{CT ratio}}$$

Solution:

$$\text{PSM} = 4000 / (1.5 \times (400/5)) = 33.33.$$

What are the various types of transformer faults?

The various types of transformer faults are

1. Incipient fault
2. Internal fault
3. Phase-to-phase and phase-to-ground fault
4. Saturation of magnetic circuit
5. Earth fault
6. Through fault
7. Overloading
8. High voltage surges due to lightning

1. Why busbar protection is needed?

- a) Fault level at busbar is high
- b) The stability of the system is affected by the faults in the bus zone.
- (c) A fault in the bus bar causes interruption of supply to a large portion of the system network.

What are the merits and the demerits of a static relay over electromagnetic relay?

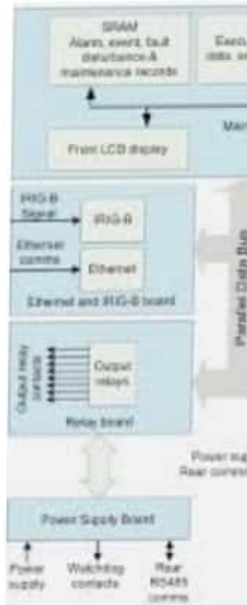
Merits and demerits of a static relay over electromagnetic relay are

1. Low power consumption as low as 1mW
2. No moving contacts; hence associated problems of arcing, contact bounce, erosion, replacement of contacts are avoided.
3. No gravity effect on operation of static relays. Hence it can be used in ships, aircrafts etc.
4. A single relay can perform several functions like over current, under voltage, single phasing protection by incorporating respective functional blocks. This is not possible in electromagnetic relays.
5. Static relay is compact.
6. Superior operating characteristics and its accuracy is more.
7. Programmable operation is possible with static relay.
8. Effect of vibration is negligible; hence it can be used in earthquake-prone areas.
9. Simplified testing and servicing. It can convert even non-electrical quantities to electrical in conjunction with transducers.

Numerical relay



Numerical Relays



In utility and industrial electric power transmission and distribution systems, a numerical relay is **a computer-based system with software-based protection algorithms for the detection of electrical faults**. Such relays are also termed as microprocessor type protective relays.

. What is the main problem of the circuit breaker?

When the contacts of the breaker are separated, an arc is struck between them. This arc delays the current interruption process and also generates enormous heat which

may cause damage to the system or to the breaker itself. This is the main problem.

10th

- The breaking capacity is always stated at the r.m.s value of fault current at the instant of contact separation.
- The forces are proportional to the square of maximum instantaneous current on closing. So making capacity is stated in terms of a peak value of current.
- Making capacity = $2.55 \times$ symmetrical breaking capacity.