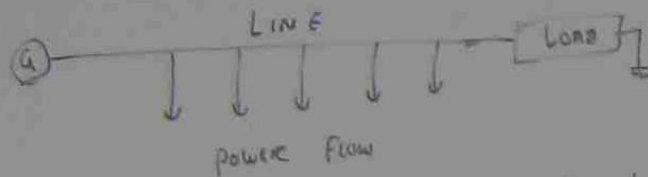
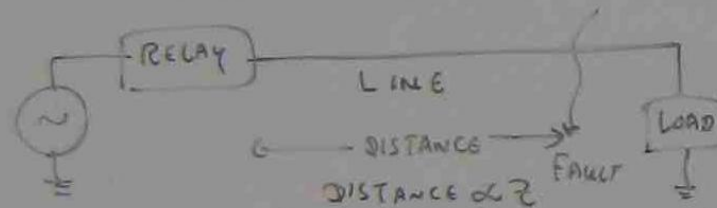


## DISTANCE RELAY



WHEN POWER FLOW OUT THROUGHOUT THE LINE,  
DISTANCE RELAY PROTECTION NEEDS TO BE UTILIZED.



$$\text{(IMPEDANCE) } Z = \frac{\text{VOLTAGE}}{\text{CURRENT}}$$

NORMAL VOLTAGE IS HIGH  
CURRENT IS LOW  
 $Z$  IS HIGH

### FAULT

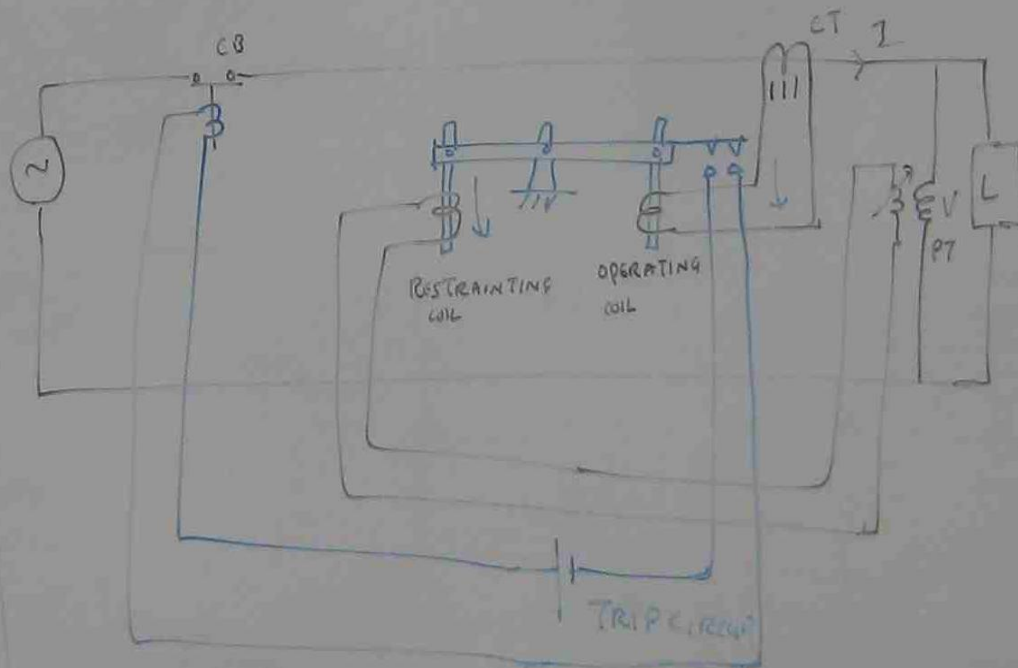
VOLTAGE IS LOW  
CURRENT IS HIGH  
IMPEDANCE IS LOW

RELAY SENSES LOW

IMPEDANCE  $\rightarrow$  TRIP C.B

# CONSTRUCTION DIAGRAM OF DISTANCE RELAY (HOW THE RELAY SENSES IMPEDANCE)

BASED ON BALANCED BEAM PRINCIPLE



DISTANCE RELAY UTILIZES BALANCED BEAM RELAY PRINCIPLE.

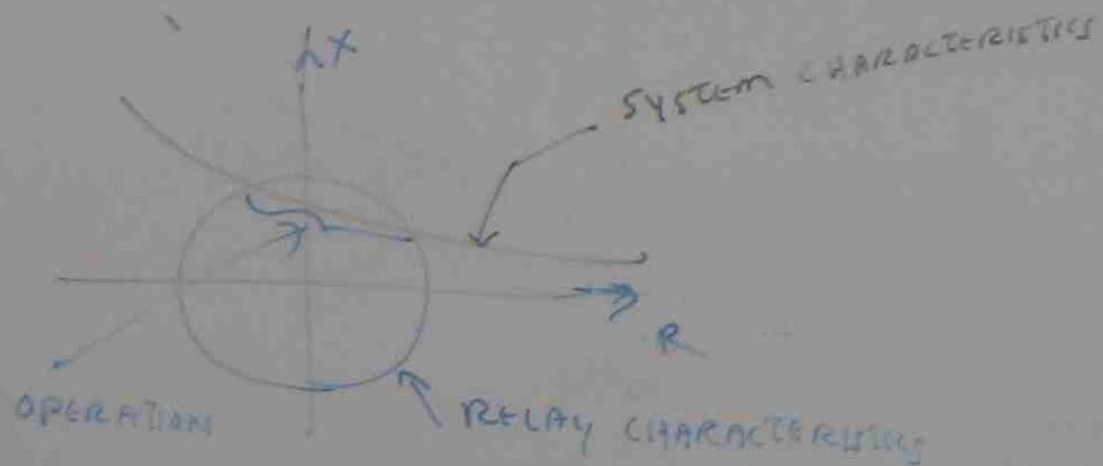
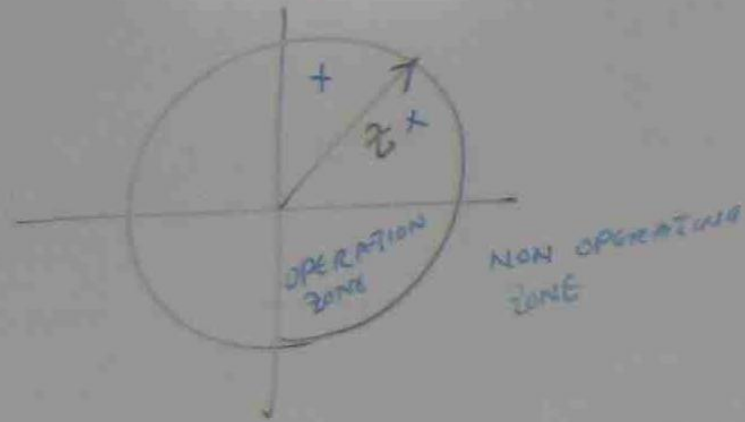
AT NORMAL CONDITION, LINE VOLTAGE IS HIGH AND LINE CURRENT IS LOW.

RESTRAINING COIL MAGNETISATION IS GREATER THAN OPERATING COIL MAGNETISATION.

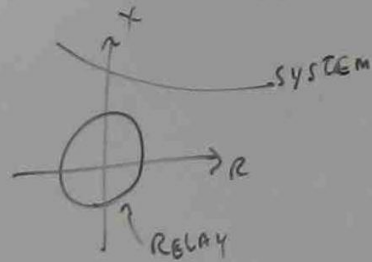
RELAY DOES NOT OPERATE.

WHEN FAULT HAPPENS, LINE VOLTAGE IS LOWER AND LINE CURRENT IS HIGHER. OPERATING COIL MAGNETISATION IS GREATER THAN RESTRAINING COIL MAGNETISATION. RELAY OPERATES.

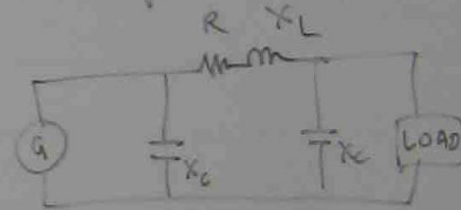
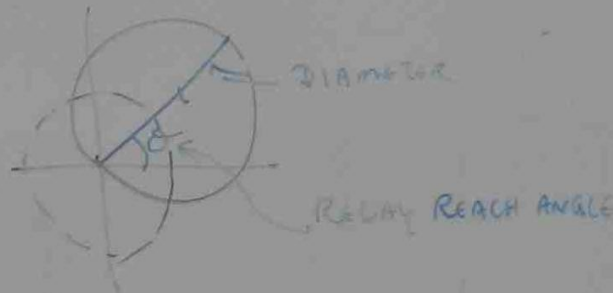
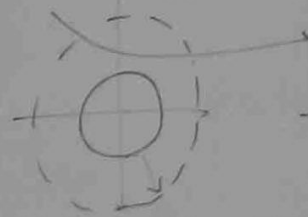
## DISTANCE RELAY OPERATION CHARACTERISTICS



# MODIFICATION OF DISTANCE RELAY CHARACTERISTICS



RELAY CT, PT SETTING  $\rightarrow Z (R \& X)$

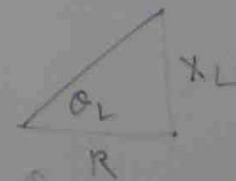


TRANSMISSION LINE MODEL

TO PROVIDE MAXIMUM PROTECTION

(RELAY REACH ANGLE)

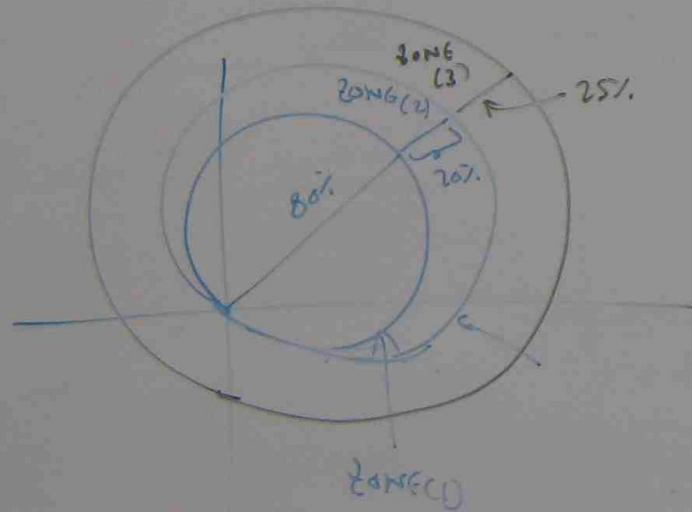
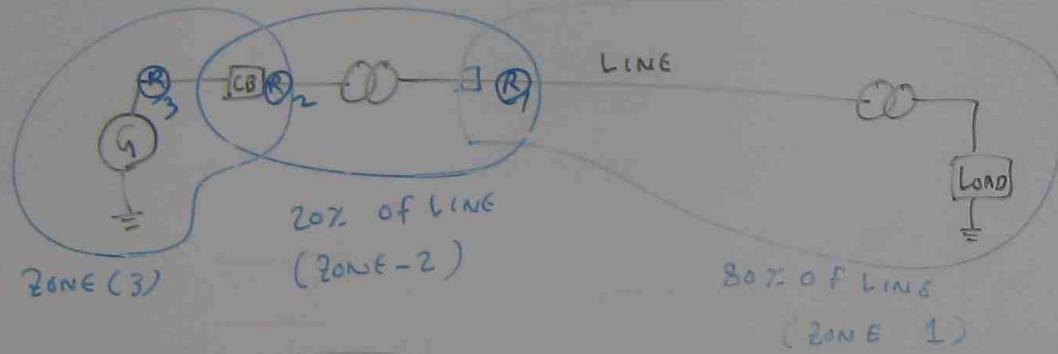
MUST BE EQUAL TO



$\theta_L$  (TRANSMISSION LINE ANGLE)

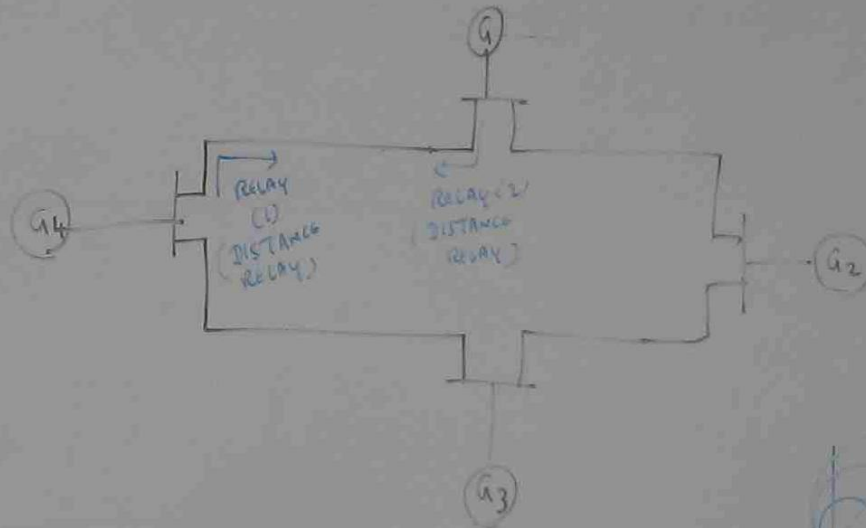
$$\theta_L = \tan^{-1} \frac{X_L}{R}$$

# ZONE FOR DISTANCE RELAY PROTECTION

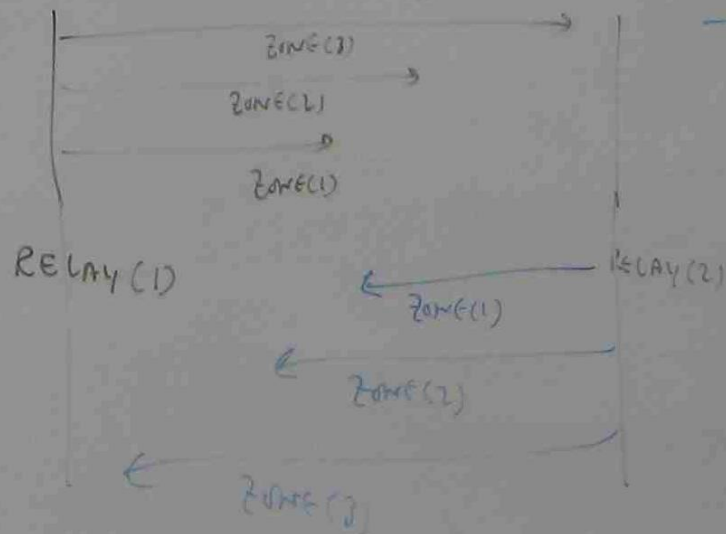


$100\Omega$      $80\Omega$  - ZONE (1)  
 $20\Omega$  - ZONE (2)

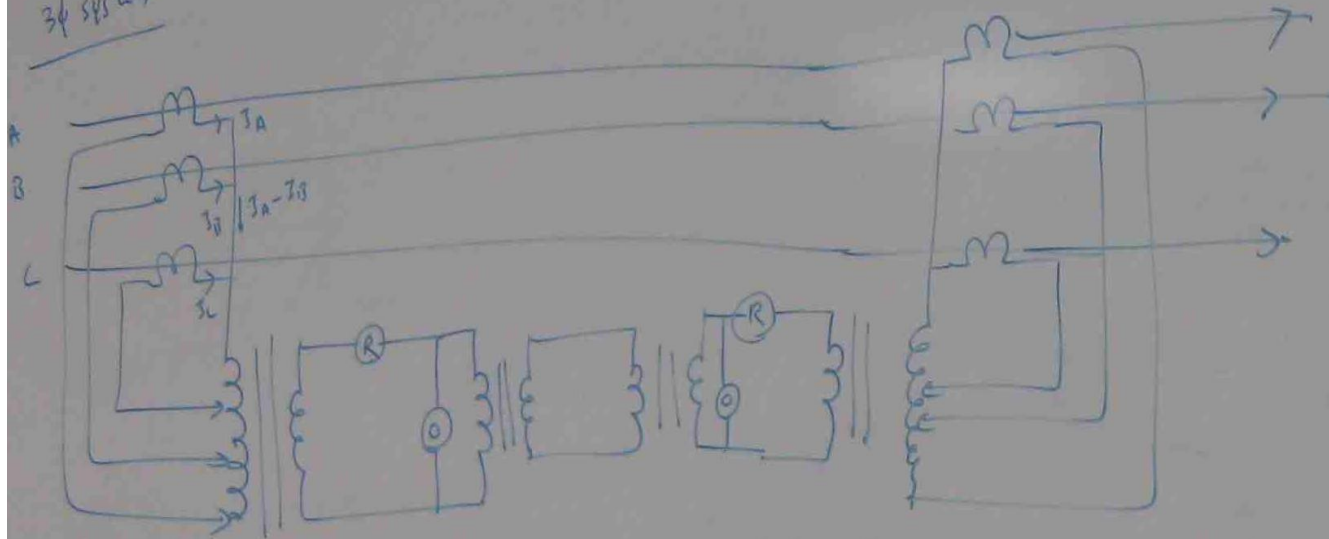
# RING SYSTEM



THE DISTANCE RELAYS ARE SET TO PROVIDE FULL PROTECTION FOR ANY DIRECTION CURRENT FLOW IN RING CIRCUIT



3 $\phi$  system



L  
FAULT

|           |                       |                      |
|-----------|-----------------------|----------------------|
| A-B FAULT | $I_A - I_B$ OPERATING | $V_{AB}$ RESTRAINING |
| B-C FAULT | $I_B - I_C$ OPERATING | $V_{BC}$ RESTRAINING |
| C-A FAULT | $I_C - I_A$ OPERATING | $V_{CA}$ RESTRAINING |

L  $\rightarrow$  G FAULT

|                         |                                 |                                   |
|-------------------------|---------------------------------|-----------------------------------|
| A $\rightarrow$ G FAULT | $I_{A \rightarrow G}$ OPERATING | $V_{A \rightarrow G}$ RESTRAINING |
| B $\rightarrow$ G FAULT | $I_{B \rightarrow G}$ _____     | $V_{B \rightarrow G}$ _____       |
| C $\rightarrow$ G FAULT | $I_{C \rightarrow G}$ _____     | $V_{C \rightarrow G}$ _____       |

OPERATING QUANTITY IS DERIVED FROM DIFFERENCE -  
BETWEEN PHASE CURRENTS AND PHASE TO GROUND CURRENT

RESTRAINING QUANTITY IS DERIVED FROM DIFFERENCE  
BETWEEN LINE VOLTAGES AND LINE TO GROUND VOLTAGE



