Department of Electrical and Electronic Engineering (EEE)
Faculty of Engineering (FE)
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Power System Protection

Summer 2020-21

Final Assignment

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Section :	D

Marks for this assignment (to be filled by the faculty)

Question No.	Obtained marks
1	/5.0
2	/5.0
3	/5.0
4	/10.0
5	/5.0
	Total = /30

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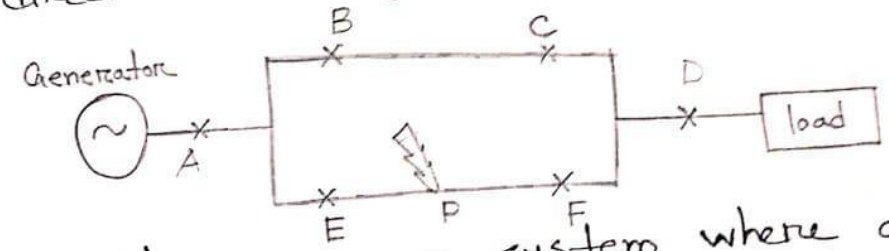
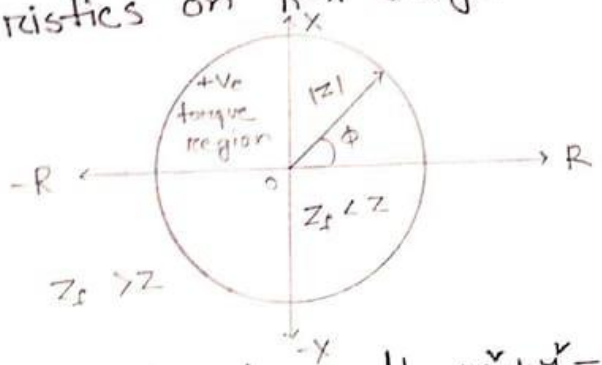
1. Directional relay only operate when current flow through in a particular direction and current must be above the pickup current. For directional over current relay the fault current can flow in both the directions through the relay either forword or reverse depending upon the fault location. Therefore it is necessary to make the relay respond for a particular defined direction, so that proper discrimination is possible. This can be possible by directional relay.



let consider a power system where a generator is connected to the load by two busbar. In between there are 6 circuit breakers A, B, C, D, E, F are connected where D, F are directional over current relay. Consider that a fault occure at P point. We know that current always flow through the low directional path. So current flow from generator G through CB A and E. Also the fault current flow from breaker A, B, C and F. Here directional relay F operate as an ~~over~~ directional over current relay.

(3)

3. The operating characteristics of an impedance relay can be more easily represented by a diagram called R-X diagram. This diagram is shown in a plane having X-axis as Resistance while the Y-axis as reactance. Distance protection is a non-unit system of protection which measures the impedance between the relay location and the point where the fault is incident and compares it with the set value. If the measured impedance is less than the set value, the relay operates and isolates the faulty section. The operating characteristics on R-X Diagram is given below:



$$Z = R + jX$$
$$|Z| = \sqrt{R^2 + X^2}$$
$$Z^2 = R^2 + X^2$$

We know, according to math $x^2 + y^2 = r^2$ equation of circle ; according to that equation of |Z|(impedence) represents the circle

So, $\tan\phi = \frac{X}{R}$

$\phi = \tan^{-1}\frac{X}{R}$

if, Z_f = Impedence between relay and fault point

Z: Set value of impedence

$Z_f < Z$ → relay operates

$Z_f > Z$ → relay is inoperative

(4)

4.

(a)

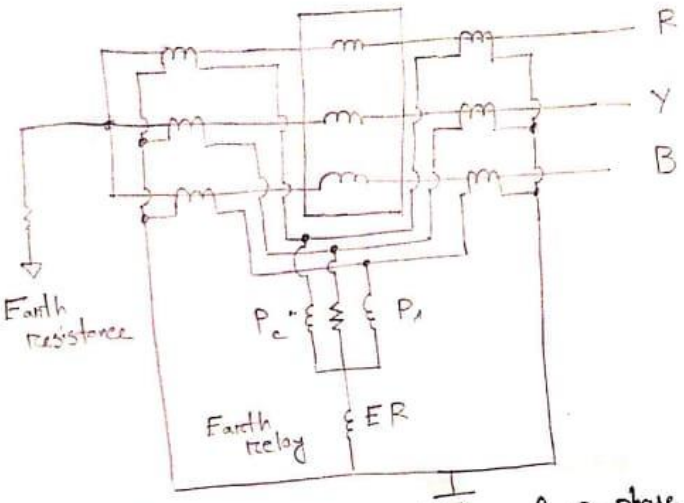


Fig : Combain primary protection of 3-phase generator for stator coinding and earth fault

(b)

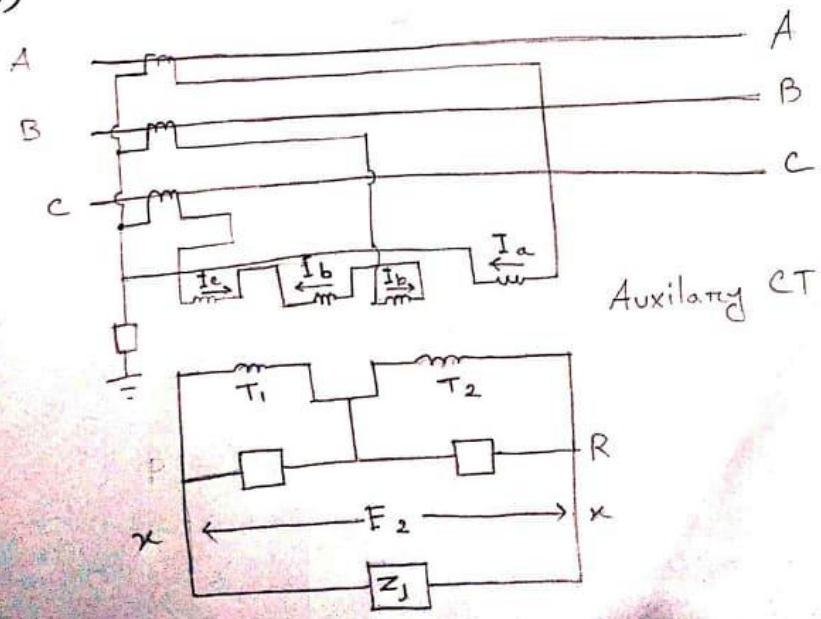


Fig : Negative phase sequence scheme

(5)

(c)

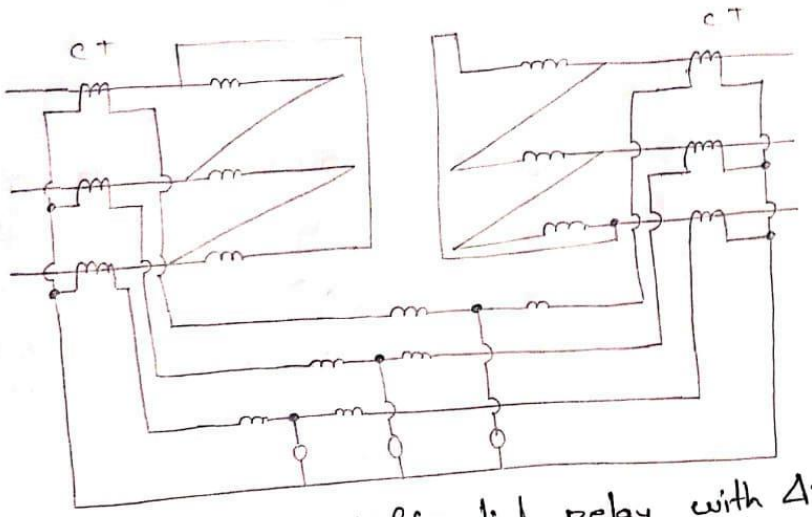


Fig: Differential relay with Δ-Δ transformer

5. Buchholz relay is a safety device which is generally used in large oil immersed transformer. It is a type of oil and gas actuated protection relay. It is used for the protection of transformer from the fault occuring inside the transformer such as impulse breakdown of the insulating oil, insulation failure of turns etc. Whenever a minor fault occure inside the transformer heat is produced by the fault current. The produced heat causes decomposition of transformer oil and gas bubbles are produced. There gas bubbles flow in upward direction and get collected by buchholz relay. The collected gas displaced the oil in the buchholz relay and the upper float to close the upper mercury switch which is connected to an alarm circuit. During minor fault the production of gas is not enough to move the lower float. Thats why in this situation, lower float is unaffected. During major ~~fault~~ fault, the heat generation is high and a large amount of gas is produced. The large amount of gas will similarly flow upwards, but its motion is high enough to tilt the lower float in the buccholz relay.