

M.E. ELECTRICAL ENGINEERING FIRST YEAR SECOND SEMESTER - 2018**SUBJECT: - POWER SYSTEM PROTECTION**

Time: Three hours

Full Marks: 100

No. of Questions	Answer any <i>five</i> questions	Marks
1) a)	What is the purpose of protective relays? Is there any conflict between the speed of operation and the accuracy of the relay? What do you mean by primary protection zone and back up protection zone? Which properties of relays are expected for these two zones?	(3+2+3+2=10)
b)	With help of a block diagram explain the operation of a relay.	(10)
2) a)	Explain the duality property between a 2-input phase comparator and a 2- input amplitude comparator.	(10)
b)	Obtain the general characteristics of a 2-input amplitude comparator using average comparison of input quantities.	(10)
3) a)	Explain how a 3-input phase sequence detector works. Also obtain its characteristic with the help of a combination of 2-input sine comparator. Draw the equivalent circuit of an n-input phase sequence detector.	(5+3+2=10)
b)	Explain, with suitable circuit diagrams, the function of a rectifier bridge type amplitude comparator.	(10)
4) a)	On what factors does the reach of the over current relay depends? Explain their effect on the reach of the over current relay.	(5)
b)	Considering a balanced transmission line explain how a distance relay detect and locate three phase fault, double line fault and single line to ground fault.	(15)
5) a)	Explain how zone discrimination is carried out on a transmission line by Distance Relay.	(10)
b)	Deduce the expression for the apparent impedance seen by a relay in a two area system as function of angle of separation δ . Show that the locus is a straight line if $ E_A = E_B $.	(10)
6) a)	What is the ideal protection characteristic for wire pilot relaying. What do you understand by "circulating current scheme" with regard to wire pilot relaying?	(5+5=10)

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	b)	Develop the characteristic equations at the two ends of a pilot wire feeder when restraining coils is on the pilot side for a circulating current scheme.	(10)
7)	a)	In a Carrier Aided Distance Protection scheme, explain how carrier signal is coupled and trapped in to the desired line section.	(10)
	b)	Describe the operating principle of Blocking Scheme for Carrier Aided Distance Protection.	(10)
8)		Write short notes on (any two): (i) Phase comparison relaying for both internal and external faults. (ii) The design of an Ohm relay and an Offset Mho relay with the help of two input 90° phase comparator. (iii) Mho relay is least prone to the effect of power swing. In this regard also explain out of step blocking in distance relay-explain with the help of a trip circuit. (iv) General characteristic obtained by a two-input phase comparator and show the plot on a complex plane.	(2×10)