

Ref No:

Ex/PG/EE/T/129C/2025

Ex/PG/ELE/PC/T/122C/2025

M.E. ELECTRICAL ENGINEERING FIRST YEAR SECOND SEMESTER EXAM 2025
SUBJECT: - POWER SYSTEM PROTECTION (PS)

Time: Three hours

Full Marks: 100

No. of Questions	Answer any <i>five</i> questions	Marks
1)	a) Explain the main features of protective relaying. Are they independent of each other? Explain the zonal protection philosophy with regard to power system protection.	(4+2+4)
	b) Explain the primary and back up protection of relays. Explain the different types of back up protection relays.	(10)
2)	a) State the reasons for the development of two input comparators. Also explain the general characteristics obtained by two input phase comparators.	(10)
	b) Explain with relevant phasor diagrams and circuit diagrams the operation of multi input phase sequence detector.	(10)
3)	Explain, with suitable circuit and phasor diagrams, the working principle and features of the following types of phase comparators: i) Induction cup phase comparator. ii) phase splitting type phase comparator. iii) Rectifier bridge amplitude comparator.	(20)
4)	a) Considering a balanced transmission line explain how double line to ground fault and single line to ground fault are located and detected by a distance relay.	(10)
	b) Design an Impedance relay and an Offset Mho relay with the help of two input 90° phase comparator.	(10)
5)	a) With the help of relevant trip circuit diagram explain the out-of-step blocking scheme used in Mho relays to protect a transmission line against power swings.	(6)
	b) Write short notes on (i) Impedance Relay, and (ii) Reactance Relay.	(5+5)
	c) Discuss the effect of series capacitance on distance relaying. Explain in the context of a mho relay.	(4)

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- 6)
 - a) Develop the characteristics equations at the two ends of a pilot wire feeder when restraining coils is on the C.T. side for a circulating current scheme. (10)
 - b) Why for the protection of short transmission lines wire pilot relays preferred to distance relays? Explain each of the problems in wire pilot relaying. (10)
- 7)
 - a) What are the attributes of an Ideal Carrier Channel? What are the various possible carriers of information for relaying purpose? (10)
 - b) Describe the operating principle of inter-tripping scheme for carrier aided distance protection. (10)
- 8)
 - a) Discuss the basic components of digital protection scheme. (10)
 - b) How digital relays utilize Fourier Analysis technique for determination of fundamental frequency voltage and current from power system signals ? (10)