Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem (Even) Examination May-2022

EE5CP07 Advanced Power System Protection

Programme: M.Tech. Branch/Specialisation: EE

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. The demerit of static relay is/are- **1**

(a) Fast response (b) Long Life

(c) Temperature sensitive (d) Compact size

ii. Comparator generally compare- **1**

(a) Two electrical quantities (b) Two mechanical quantities

(c) Both (a) and (b) (d) None of these

iii. The distance relay used for the protection of transmission and sub-transmission lines at **1**

(a) 220 kV (b) 132 kV (c) 33 kV (d) All of these

iv. Which relay is directional relay? **1**

(a) Impedance relay (b) MHO relay

(c) Reactance relay (d) All of these

v. To implement phase-fault compensation, the CTs are connected in - _____ and relays in _____ configuration. **1**

(a) Star, delta (b) Delta, star (c) Star, star (d) Delta, delta

vi. With static overcurrent relays it is possible to realise time-current characteristic is/are- **1**

(a) Inverse (b) Very inverse

(c) Extremely inverse (d) All of these

vii. In the power swing analysis, in the out-of-step tripping scheme the sequence of traversal of areas while direction of power swing is from right to left **1**

(a) $A_1 \rightarrow A_2 \rightarrow A_3$ (b) $A_3 \rightarrow A_2 \rightarrow A_1$

(c) $A_1 \rightarrow A_3 \rightarrow A_2$ (d) None of these

P.T.O.

viii. Mal-operation of distance relay avoid if we use a relay with: **1**
(a) Elliptical characteristics (b) Circle characteristics
(c) Straight line characteristics (d) None of these

ix. A protective relay which operates when the load current exceeds a preset value, is called **1**
(a) A distance relay (b) A directional relay
(c) An overcurrent relay (d) None of these

x. A MHO relay is a- **1**
(a) Voltage restrained directional relay
(b) Voltage controlled over current relay
(c) Directional restrained over current relay
(d) Directional restrained over voltage relay

Q.2 i. Enlist the advantages of static relays. **2**

ii. Describe the operation of opposed voltage type comparator using proper diagram. **3**

iii. Explain basic construction of static relay with the help of proper diagram. **5**

OR iv. Explain the working of rectifier bridge comparators using proper diagram. **5**

Q.3 i. How static differential relay is different from conventional differential relay? **2**

ii. What is an angle impedance relay? Discuss how its characteristics is realised using the phase comparison technique. **8**

OR iii. Write technical note on harmonic restrain relay. **8**

Q.4 i. List the features of 500 kV relaying protection system. **3**

ii. Compare instantaneous overcurrent and time overcurrent relays on the basis of their principle of operation. **7**

OR iii. Compare definite time and inverse definite time overcurrent relays on the basis of their operating characteristics. **7**

Q.5 i. Explain switched distance scheme applied in hybrid comparator. **4**

ii. Compare out-of-step blocking scheme and out-of-tripping scheme used in the power swing analysis. **6**

OR iii. Compare various poly phase distance schemes on the basis of their technical features. **6**

Q.6 Attempt any two:

i. Explain basic principle of digital computer relaying. **5**

ii. Develop the generalized mathematical expressions for distance relays. **5**

iii. Discuss the realization of offset MHO characteristics with the help of proper diagram. **5**

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Scheme of Marking

MEDI-CAPS UNIVERSITY Knowledge is Power	Faculty of Engineering End Sem (Even) Examination May-2022 Advanced Power System Protection EE5CP07 Programme: M.Tech. | Branch/Specialisation:

Note: The Paper Setter should provide the answer wise splitting of the marks in the scheme below.

Q.1	i)	The demerits of static relay is/are (c) temperature sensitive	1
	ii)	~~An amplitude comparator compares the magnitudes of two input quantities, irrespective of the angle between them.~~ ~~(a) True~~ Comparator generally compare (a) two electrical quantities	1
	iii)	The distance relay used for the protection of transmission and sub-transmission lines at (d) All	1
	iv)	~~In the sampling comparator, if sampling is to be carried out every half cycle, the scheme is a slower one but its circuit is simpler and less expensive.~~ which relay is directional relay ~~(b) False~~ (b) MHO relay	1
	v)	To implement phase-fault compensation, the CTs are connected in ---------- and relays in ---------- configuration. (b) delta, star	1
	vi)	With static overcurrent relays it is possible to realise time-current characteristic is/are – (d) All	1
	vii)	In the power swing analysis, in the out-of-step tripping scheme the sequence of traversal of areas while direction of power swing is from right to left (a) $A_1 \rightarrow A_2 \rightarrow A_3$	1
	viii)	~~The heart of any relay is always a comparator.~~ mal-operation of distance relay avoid if we use a relay with (a) elliptical characteristics ~~(a) True~~	1
	ix)	A protective relay which operates when the load current exceeds a preset value, is called (c) an overcurrent relay	1
	x)	A MHO relay is a (a) voltage restrained directional relay	1

Q.2	i.	Enlist the advantages of static relays. For four points give 2 marks.	2
	ii.	Describe the operation of opposed voltage type comparator using proper diagram. Explanation 1.5 marks and diagrams 1.5 marks.	3
	iii.	Explain basic construction of static relay with the help of proper diagram. Explanation 2 marks and diagrams 3 marks.	5
OR	iv.	Explain the working of rectifier bridge comparators using proper diagram. Explanation 2 marks and diagrams 3 marks.	5
Q.3	i.	How static differential relay is different from conventional differential relay? 2 marks for at least four points.	2
	ii.	What is an angle impedance relay? Discuss how its characteristics is realised using the phase comparison technique. For first part of the question 2 marks and for other part having diagrammatic representation 6 marks.	8
OR	iii.	Write technical note on harmonic restrain relay. For technical points 4 marks and for diagrams 4 marks.	8
Q.4	i.	List the features of 500kV relaying protection system. 3 marks for at least 6 points.	3
	ii.	Compare instantaneous overcurrent and time overcurrent relays on the basis of their principle of operation. 3.5 marks for the explanation of instantaneous overcurrent relay and 3.5 marks for the explanation of time overcurrent relay.	7
OR	iii.	Compare definite time and inverse definite time overcurrent relays on the basis of their operating characteristics. 3.5 marks for the explanation of time definite overcurrent relay and 3.5 marks for the explanation of inverse definite time overcurrent relay.	7
Q.5	i.	Explain switched distance scheme applied in hybrid comparator. 2 marks for explanation and 2 marks for diagrams.	4
	ii.	Compare out-of-step blocking scheme and out-of-tripping scheme used in the power swing analysis. 3 marks for the explanation of out-of-step blocking scheme and 3	6

		mark for the explanation of out-of-tripping scheme.	
OR	iii.	Compare various poly phase distance schemes on the basis of their technical features. For each scheme 2 marks.	6
Q.6		Attempt any two:	
	i.	Explain basic principle of digital computer relaying. 2.5 marks for the explanation and 2.5 marks for the diagrams.	5
	ii.	Develop the generalized mathematical expressions for distance relays. step marking applied	5
	iii.	Discuss the realization of offset MHO characteristics with the help of proper diagram. 2.5 marks for the explanation and 2.5 marks for the diagrams.	5

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