Reg. No.															

Question Paper Code	13434

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Seventh Semester

Electrical and Electronics Engineering

20EEEL710 - POWER SYSTEM PROTECTION AND SWITCHGEAR

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	*K – Level*	*CO*
1.	The purpose of a protective relay is to: (a) Interrupt the circuit when there is no fault (b) Measure the voltage and current in the circuit (c) Detect faults and initiate the operation of circuit breakers (d) Provide a visual indication of the fault	*1*	*K1*	*CO1*
2.	The total fault-clearing time will be (a) operating time of circuit breaker (b) operating time of relays (c) operating time of relays and circuit breaker (d) none of the above	*1*	*K1*	*CO1*
3.	Which over current relay characteristics are widely used by utilities? (a) Instantaneous over current relay (b) Inverse time over current relay (c) Inverse definite minimum time (IDMT) over current relay (d) Definite minimum time (DMT) over current relay	*1*	*K1*	*CO2*
4.	The primary operating principle of a distance relay is based on: (a) The measurement of current only (b) The measurement of voltage only (c) The ratio of voltage to current (d) The phase angle difference between current and voltage	*1*	*K1*	*CO2*
5.	The method of neutral grounding affects the (a) positive sequence network (b) negative sequence network (c) zero sequence network (d) none of above	*1*	*K1*	*CO3*
6.	In which scenario is a Buchholz relay used? (a) In medium voltage cables (b) In high voltage transmission lines (c) In transformers (d) In circuit breakers	*1*	*K1*	*CO3*
7.	What is the primary function of a numerical relay? (a) To measure voltage (b) To provide protection against faults (c) To regulate power factor (d) To control motor speed	*1*	*K1*	*CO4*
8.	What type of components is primarily used in static relays? (a) Mechanical switches (b) Semiconductor devices (c) Magnetic coils (d) Capacitors and inductors	*1*	*K1*	*CO4*
9.	The rated current of a three phase, 33 kV oil circuit breaker is 1300 A. If its symmetrical breaking capacity is 3500 MVA, then it's making capacity is (a) 8925 MVA (b) 8650 MVA (c)8800 MVA (d) 8375MVA	*1*	*K2*	*CO5*
10.	In which type of circuit breaker is the arcing chamber typically filled with oil? (a) Air circuit breaker (b) Vacuum circuit breaker (c) Oil circuit breaker (d) Miniature circuit breaker	*1*	*K1*	*CO5*

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11.	Define Pick up value in a relay.	*2*	*K1*	*CO1*
12.	Compare primary and backup protection.	*2*	*K2*	*CO1*
13.	Define the term 'Discrimination' in a protective system.	*2*	*K1*	*CO1*

14.		A relay is connected to 400/5 ratio CT with current setting of 150%. Find PSM when circuit carries a fault current 0f 4000A.	2	K3	CO2
15.		What are the limitations of Electromagnetic relays?	2	K2	CO2
16.		Classify the different types of over current relays based on the inverse time characteristics.	2	K2	CO2
17.		The relay settings for a percentage differential protection scheme of the generator are as under. (i) Pick-up current = 0.1 A (ii) Slope = 15 % (iii) CT ratio = 500/1 A A high resistance single line-to-ground external fault occurs when the generator is supplying power to the load. The magnitude of current through CT1 and CT2 is 450 A and 380 A, respectively. Determine whether the relay will operate in case of the given situation.	2	K3	CO3
18.		Why secondary of C.T should not be open?	2	K2	CO3
19.		State the difference between conventional relay and numerical relay.	2	K2	CO4
20.		Explain the significance of communication features in numerical relays.	2	K2	CO4
21.		A CB is designed to disconnect a transformer having peak magnetizing current of 7 A. The system capacitance and inductance are 2.5 H/phase and 3 nF/phase, respectively. At the time of interruption, the inductive energy is discharged into the capacitance. What would be the over voltage appear across the contacts of CB?	2	K3	CO5
22.		What is the difference between re-striking voltage and recovery voltage?	2	K2	CO5

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Why the protective zones are arranged in overlap fashion? With the help of simple diagram, show how the zones are overlapped.	11	K2	CO1
		OR			
	b)	Compare and contrast solid grounding and resistance grounding.	11	K2	CO1
24.	a)	Explain with the help of neat sketch, the construction and working of directional induction type overcurrent relay.	11	K2	CO2
		OR			
	b)	How an impedance relay is used for distance protection. Obtain its operating characteristics and represent the R-X diagram.	11	K3	CO2
25.	a)	Explain percentage differential protection of transformer.	11	K2	CO3
		OR			
	b)	Explain the protection scheme of an induction motor.	11	K2	CO3
26.	a)	What is the tripping criterion of the numerical differential relay used for percentage differential protection of synchronous generator? How can this tripping criterion be implemented.	11	K3	CO4
		OR			
	b)	Make use of phase comparator and synthesize reactance relay.	11	K3	CO4
27.	a)	Explain the phenomenon of current chopping with suitable diagrams.	11	K2	CO5
		OR			
	b)	Explain the construction and working principle of SF_6 circuit breaker.	11	K2	CO5
28.	a) (i)	Discuss the operation of numerical distance relay with the help of block diagram.	5	K2	CO4
	(ii)	Explain the physics of arc phenomenon and interruption.	6	K2	CO5
		OR			
	b) (i)	Discuss the numerical overcurrent protection of power system.	5	K2	CO4
	(ii)	Derive the expression for restriking voltage and maximum RRRV.	6	K2	CO5