Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VII EXAMINATION – WINTER 2025

Subject Code:3170908 Date:24-11-2025

Subject Name:Switchgear And Protection

Time:10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Define following qualities of a protective relay: (i) Selectivity (ii) Discrimination (iii) Reliability	**03**
	(b)	Draw basic Trip circuit and Describe.	**04**
	(c)	Draw a schematic diagram of Simple and Percentage Differential Protection, and differentiate them in details.	**07**
Q.2	**(a)**	Classify various busbar protection schemes.	**03**
	(b)	Draw a schematic diagram of Earth Leakage Protection and Explain in details.	**04**
	(c)	Draw and discuss Normal Inverse, IDMT, Very Inverse and Extremely Inverse characteristic of over current relay concerning to protection coordination.	**07**
		OR	
	(c)	Illustrate the protection against loss of excitation and loss of prime mover in generator.	**07**
Q.3	**(a)**	What do you understand by reach, under reach and over reach of a relay?	**03**
	(b)	Explain the Mho and Offset Mho relay with a neat R-X characteristic.	**04**
	(c)	In which machine gas operated relay is used? Explain gas operated relay operation in details with neat sketch and enlist the advantage as well as disadvantage.	**07**
		OR	
Q.3	**(a)**	Enumerate the superiority of distance relay for the protection of transmission line.	**03**
	(b)	The current rating of a relay is 5 A. Plug setting is 1.5, TMS = 0.4, CT ratio 400/ 5, fault current is 6000 A. At TMS =1, operating time at various PSM are given in the following table.	**04**

PSM	2	4	5	8	10	20
Operating Time (Sec)	10	05	04	03	2.8	2.4

Determine the operating time of the relay.

	(c)	Demonstrate the Comparison of all the distance relays concerning to the effect of arc resistance, power swing on the relay performance and operating and restraining quantity.	**07**

Q.4	**(a)**	Describe the operation of 3–stepped distance protection	**03**
	(b)	Explain capacitor voltage transformer. Give its comparison with electromagnetic potential transformer	**04**
	(c)	List and explain the various abnormal operation conditions against which a large induction motor has to be protected.	**07**
		OR	
Q.4	**(a)**	Describe different abnormalities in the transformer.	**03**
	(b)	Compare protective CT with measuring CT.	**04**
	(c)	Explain stator inter-turn fault protection for generator with schematic diagram.	**07**
Q.5	**(a)**	Explain the concept of adaptive relaying.	**03**
	(b)	Explain protection of generator against unbalanced loading.	**04**
	(c)	With a neat figure, explain the construction and working of an SF6 circuit breaker including its advantages and disadvantages.	**07**
		OR	
Q.5	**(a)**	Draw and explain the general block diagram of numerical relay	**03**
	(b)	Explain restricted earth fault protection of three phase transformer with neat sketch.	**04**
	(c)	Discuss Recovery Rate Theory (Slepian's Theory) and Energy Balance Theory (Cassie's Theory) for arc extinction in details	**07**