BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2025)

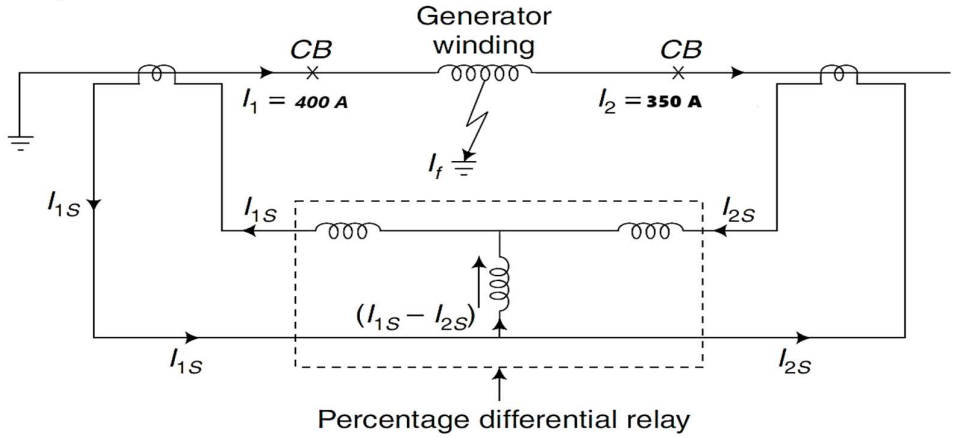
CLASS: BTECH **SEMESTER : VIth**
BRANCH: EEE **SESSION : SP/2025**

SUBJECT: EE401 SWITCHGEAR AND PROTECTION

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	What are the challenges and solutions in interrupting capacitive current?	[2]	1	2
Q.1(b)	Discuss arc quenching and development of dielectric strength of Vacuum circuit breaker.	[3]	1	2
Q.2(a)	What is the making and breaking capacity of a circuit breaker?	[2]	2	2
Q.2(b)	What is the challenge in breaking direct current? Explain the mechanism of the HVDC circuit breaker with a circuit diagram.	[3]	2	2
Q.3(a)	What is the principle of directional relay? Include mathematics and phasor diagram for explanation.	[2]	2	2
Q.3(b)	A circuit breaker interrupts the magnetising current of a 150 MVA transformer at 220 kV. The magnetising current of the transformer is 7% of the full load current. Determine the maximum voltage which may appear across the gap of the breaker when the magnetising current is interrupted at 60% of its peak value. The stray capacitance is 2.5 μF. The inductance is 30 H.	[3]	2	3
Q.4(a)	How does a thermal relay work? What are the applications of thermal relays?	[2]	1	2
Q.4(b)	What is a numerical relay? Draw the schematic diagram of a typical numerical relay and explain it.	[3]	1	2
Q.5(a)	What are the applications of IDMT and inverse overcurrent relays? Draw the time current characteristics of IDMT and inverse overcurrent relays.	[2]	2	2
Q.5(b)	Below figure shows percentage differential relay applied to the protection of a generator winding. The relay has a 0.125 amp minimum pick-up and 10% slope of its operating characteristic on $(I_{1s} + I_{2s})/2$ versus $(I_{1s} - I_{2s})$ in diagram. A high resistance ground fault occurred near the grounded neutral end of the generator winding while generator is carrying load. As a consequence, the currents flowing at each end of the winding is shown in the figure. Assuming CT ratios of 500/5 amperes. a) The percentage differential relay will operate to trip the breaker. b) The value of differential current passing through the operating coil of relay. c) The value of through current passing through the restraining coil of relay.	[3]	2	3



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