BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2024)

CLASS: BTECH **SEMESTER : 6TH**
BRANCH: EEE **SESSION : SP/2024**

SUBJECT: EE401 SWITCHGEAR & PROTECTION

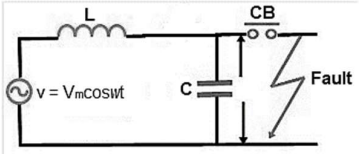
TIME: 02 Hours **FULL MARKS: 25**

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)	Describe the functions of a protective system in a power system network?	[2]	1	2
Q.1(b)	The current rating of an overcurrent relay is 5A. The relay has a plug setting of 150% and time multiplier setting of 0.4. The CT ratio is 400/5. Determine the operating time of the relay for a fault current of 6000A. At TMS = 1, operating time at various PSM are given in the following table.	[3]	1	3

PSM	2	4	5	8	10	20
Operating time in seconds	10	5	4	3	2.8	2.4

Q.2(a)	What are the bases of deciding the zones of protection in an electrical power network?	[2]	3	2
Q.2(b)	For the equivalent circuit of the circuit breaker given below derive the expression for restriking voltage. What is the condition for maximum value of restriking voltage and what is it?	[3]	2	1,2



Equivalent Circuit

Q.3(a)	With proper mathematical expression describe the operation of electromagnetic induction disc type relay.	[2]	2	2
Q.3(b)	A 50 Hz, 13.8 kV, 3-phase generator with grounded neutral has an inductance of 15mH/phase and is connected to a busbar through a circuit breaker. The capacitance to earth between the generator and circuit breaker is 0.05μF/phase. Determine the time for maximum restriking voltage; Frequency of oscillation and average rate of rise of restriking voltage.	[3]	2	3
Q.4(a)	High voltage gradient and high temperature, which one is responsible for initiation of arc, and which one is responsible for sustaining the arc in the circuit breaker when its contacts start parting from each other? Give proper justification of your choice.	[2]	2	5
Q.4(b)	A circuit breaker is rated at 1200 A, 1500 MVA, 33 kV, 3-sec 3-phae oil circuit breaker. What are its rated normal current, breaking current, making current, and short-time rating?	[3]	2	3
Q.5(a)	Which properties of SF_6 gas makes it suitable for arc quenching medium in circuit breaker?	[2]	2	1
Q.5(b)	Classify the protective relays based on function and based on technology.	[3]	2	1

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