GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Fifth Semester Regular) Examinations, December – 2023

21BELPC35004 /21BEEPE35004 – Switchgear and Protection

(EE & EEE)

Time: 3 hrs Maximum: 70 Marks

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions		CO #	Blooms Level
a.	What do you understand by switchgear? Enumerate various types of switchgears.	CO1	K1
b.	Define (i) arc voltage, (ii) breaking capacity of a circuit breaker.	CO1	K1
c.	Which type of relay is best suited for long distance high voltage transmission line.	CO2	K2
d.	What are the difficulties experienced in differential relay in generator protection?	CO3	K2
e.	What is the necessity of earthing?	CO4	K2

PART – B **(15 x 4 = 60 Marks)**

Answer ***ALL*** questions		Marks	CO #	Blooms Level
2. a.	For a 132Kv system, the reactance and capacitance up to the location of Circuit breaker is 3 ohms and 0.015μF, respectively. Calculate the i) The frequency of transient oscillation. ii) The maximum value of restriking voltage cross the contacts of the Circuit breaker. iii) The maximum value of RRRV.	8	CO1	K3,K4
b.	With necessary diagrams describe the recovery rate theory and energy balance theory of arc interruption in a circuit breaker.	7	CO1	K2,K3
	(OR)			
c.	In a short circuit on 132 kV 3-phase system, the breaker gave the following results: Power factor of the fault = 0.45 Recovery voltage = 0.9 times full line voltage The breaking current is symmetrical and the restriking transient had a natural frequency of 15 kHz. Determine the rate of rise of restriking voltage (RRRV) in the following types of faults: (i) Grounded fault (ii) Ungrounded fault.	8	CO1	K3,K4
d.	Describe the construction, operating principle and application of SF6 circuit breaker with a neat sketch.	7	CO1	K2,K3
3.a.	Stare and explain Static relay with a block diagram and explain its advantages	8	CO2	K2,K3, K4

	and disadvantages.			
b.	Explain balanced beam type relay. Mention application of electromagnetic relay.	7	CO2	K2,K3
	(OR)			
c.	Describe the principle of percentage biased differential relay with necessary diagrams. Also discuss its applications.	8	CO2	K2,K3, K4
d.	Explain attracted armature type relay. Also mention advantages of electromagnetic relay.	7	CO2	K2,K3
4.a.	A 3-phase, 12MVA, 6.6KV star connected alternator has a per phase reactance of 12%. It is protected by Merz-Price circulating current principle which is set to operate for fault current not less than 180A. Calculate the value of earthing resistance to be provided in order to ensure that only 12% of the alternator winding remains unprotected.	8	CO3	3,4
b.	What do you understand by a zone of protection? Discuss various zones of protection.	7	CO3	K2,K3, K4
	(OR)			
c.	A 13.8 kV, 150MVA, star connected alternator has a synchronous reactance of 1.68 per unit per phase and a negligible resistance. It is protected by Merz-Price balanced current system which operates when out of balance current exceeds 10% of the full load current. If the neutral point is earthed through a resistance of 2.5 Ω, determine what portion of winding is protected against earth fault.	8	CO3	K3,K4
d.	Discuss the different methods employed for the protection of transmission line.	7	CO3	K2,K3, K4
5.a.	What is Peterson coil? Explain the protective function performed by this device with necessary diagram.	7	CO4	K2,K3, K6
b.	With a neat diagram explain the operation of any one type of lightning arrester.	8	CO4	K2,K3
	(OR)			
c.	What is lightening? Describe the mechanism of lighting discharge by drawing suitable diagrams.	7	CO4	K2,K3, K6
d.	Explain solid grounding with a suitable diagram.	8	CO4	K2,K3

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