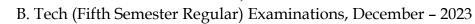
Reg.

No

AY 21

GIET UNIVERSITY, GUNUPUR – 765022



21BELPC35004 /21BEEPE35004 - Switchgear and Protection

(EE & EEE)

| Ti | ime: 3 hrs | laximum | n: 70 M | arks | |
|---|--|-----------------------------------|------------|-----------------|--|
| (The figures in the right hand margin indicate marks) | | | | | |
| PART – A | | $(2 \times 5 = 10 \text{ Marks})$ | | | |
| Q.1. Answer ALL questions | | | CO # | Blooms Level | |
| a. V | What do you understand by switchgear? Enumerate various types of switchgears. | | CO1 | K1 | |
| b. l | Define (i) arc voltage, (ii) breaking capacity of a circuit breaker. | | CO1 | K1 | |
| c. V | Which type of relay is best suited for long distance high voltage transmission line. | | CO2 | K2 | |
| d. V | What are the difficulties experienced in differential relay in generator protection? | | CO3 | K2 | |
| e. V | What is the necessity of earthing? | | CO4 | K2 | |
| DAD | от в | (15 / | = 60 N | (onka) | |
| PART – B | | (15 X 4 | b = 00 IV | iarks) | |
| 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 0.015μ F, respectively. Calculate the | | | | |
| | i) The frequency of transient oscillation. | 0 | | | |
| | ii) The maximum value of restriking voltage cross the contacts of the Circuit | 8 | CO1 | K3,K4 | |
| | breaker. | | | | |
| | iii) The maximum value of RRRV. | | | | |
| b. | With necessary diagrams describe the recovery rate theory and energy | 7 | 001 | | |
| | balance theory of arc interruption in a circuit breaker. | 1 | 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 | 8 | CO1 | K3,K4 | |
| | 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. | | | | |
| d. | Describe the construction, operating principle and application of SF6 circuit | 7 | CO1 | K2,K3 | |
| | breaker with a neat sketch. | 1 | 01 | K2,KJ | |
| 2 | | | | WO WO | |

3.a. Stare and explain Static relay with a block diagram and explain its advantages 8 $CO2 = \frac{K2,K3}{K4}$

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 | 8 | CO3 | 3,4 |
| b. | the alternator winding remains unprotected. 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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