

Reg. No.

Question Paper Code

13219

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Seventh Semester

Electrical and Electronics Engineering

20EEEL710 - POWER SYSTEM PROTECTION AND SWITCHGEAR

Regulations - 2020

Duration: 3 Hours

Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

	Marks	K – Level	CO
1. H.R.C. fuses provide best protection against (a) overload (b) reverse current (c) open-circuits (d) short-circuits	1	K1	CO1
2. Thermal protection switch can protect against (a) short-circuit (b) temperature (c) overload (d) over voltage	1	K2	CO1
3. Resistance grounding is used for voltage between (a) 33kV to 66kV (b) 10kV to 33kV (c) 3.3kV and 11kV (d) none of the above	1	K2	CO1
4. Short-circuit currents are due to (a) single phase to ground faults (b) phase to phase faults (c) three phase faults (d) any of these	1	K1	CO1
5. The relay operating speed depends upon (a) the spring tension (b) the rate of flux built up (c) armature core air gap (d) all of the above	1	K2	CO2
6. Directional relays are based on flow of (a) power (b) current (c) voltage wave (d) all of the above	1	K1	CO2
7. Induction cup relay is operated due to changes in (a) current (b) voltage (c) impedance (d) all of the above	1	K2	CO2
8. Relays are used for phase faults on long line. (a) Impedance (b) Reactance (c) Either of the above (d) None of the above	1	K2	CO2
9. For which of the following protection from negative sequence currents is provided? (a) Generators (b) Motors (c) Transmission line (d) Transformers	1	K1	CO3
10. A three phase transformer having a line voltage ratio of 400/33000 V is connected in the star-delta. The CTs on the 400V side have a CT ratio of 1000/5. What must be the ratio of CTs on the 33000 side? (a) 7/5 (b) 5/7 (c) 3/5 (d) 5/2	1	K2	CO3
11. A transmission line is protected by (a) inrush protection (b) distance protection (c) time graded and current graded over current protection (d) both (b) and (c)	1	K1	CO3
12. Large internal faults are protected by (a) merz price percentage differential protection (b) mho and ohm relays (c) horn gaps and temperature relays (d) earth fault and positive sequence relays	1	K2	CO3
13. Phase comparators in case of static relays and electro-mechanical relay normally are (a) Sine and cosine comparators respectively (b) Cosine and sine comparators respectively (c) Both are cosine comparators. (d) Both are sing comparators.	1	K2	CO4

- | | | | |
|--|---|----|-----|
| 14. A Numerical relay is operate | 1 | K1 | CO4 |
| (a) Without Microprocessor | | | |
| (b) Without amplifier | | | |
| (c) With Microprocessor | | | |
| (d) With amplifier | | | |
| 15. Single phase preventers are used for | 1 | K2 | CO4 |
| (a) Transmission lines | | | |
| (b) Transformers | | | |
| (c) Motors | | | |
| (d) Underground cables | | | |
| 16. Static relay required | 1 | K1 | CO4 |
| (a) AC supply | | | |
| (b) DC Supply | | | |
| (c) DC & AC supply | | | |
| (d) no need any power supply | | | |
| 17. The arcing contacts in a circuit breaker are made of | 1 | K2 | CO5 |
| (a) copper tungsten alloy | | | |
| (b) porcelain | | | |
| (c) electrolytic copper | | | |
| (d) aluminium alloy | | | |
| 18. On which of the following routine tests are conducted? | 1 | K1 | CO5 |
| (a) Oil circuit breakers | | | |
| (b) Air blast circuit breakers | | | |
| (c) Minimum oil circuit breakers | | | |
| (d) All of the above | | | |
| 19. SF6 gas | 1 | K2 | CO5 |
| (a) is yellow in colour | | | |
| (b) is lighter than air | | | |
| (c) is nontoxic | | | |
| (d) has pungent smell | | | |
| 20. Arc in a circuit behaves as | 1 | K2 | CO5 |
| (a) a capacitive reactance | | | |
| (b) an inductive reactance | | | |
| (c) a resistance increasing with voltage rise across the arc | | | |
| (d) a resistance decreasing with voltage rise across the arc | | | |

PART - B (10 × 2 = 20 Marks)

Answer **ALL** Questions

- | | | | |
|---|---|----|-----|
| 21. What are the causes of faults in a power system? | 2 | K1 | CO1 |
| 22. Define protection zone. | 2 | K1 | CO1 |
| 23. List the basic requirements of protective relay. | 2 | K2 | CO2 |
| 24. Summarize the function of under frequency relay. | 2 | K1 | CO2 |
| 25. Why secondary of transformer should not be opened? Justify. | 2 | K1 | CO3 |
| 26. Classify the types of bus bar protection. | 2 | K2 | CO3 |
| 27. Mention the advantages of static relays. | 2 | K2 | CO4 |
| 28. Define the Inverse Time Over-current Relay. | 2 | K1 | CO4 |
| 29. Classify the circuit breakers. | 2 | K2 | CO5 |
| 30. Define the term “rate of rise of recovery voltage”. | 2 | K1 | CO5 |

PART - C (6 × 10 = 60 Marks)

Answer **ALL** Questions

- | | | | |
|--|----|----|-----|
| 31. a) Explain in detail about the various methods of overvoltage protection of overhead transmission line. | 10 | K2 | CO1 |
| (OR) | | | |
| b) Describe in detail about the need and different methods for neutral grounding with suitable diagram. | 10 | K2 | CO1 |
| 32. a) Explicate in detail about the operating principles and characteristic of impedance and mho relays with a neat sketch. | 10 | K2 | CO2 |
| (OR) | | | |
| b) Determine plug setting multiplier of a 5 ampere, 3 second over current relay having a current setting of 125% and a time setting multiplier of 0.6 connected to supply circuit through a 400/5 current transformer when the circuit carries a fault current of 4000A. | 10 | K2 | CO2 |

33. a) Illustrate the differential pilot wire methods of protection of feeder with necessary diagram. 10 K2 CO3

(OR)

- b) A 3 phase transformer having line voltage ratio of 0.4 kV/11 kV is connected in star delta and protective transformer on 400 v side have a current ratio of 500/5.what must be the ratio of the protective transformer on the 11kV side? 10 K2 CO3

34. a) Interpret the construction, working principle and operation of static over current relay with a neat diagram. 10 K3 CO4

(OR)

- b) Draw and explain the working of numerical over current protection with the flow chart. 10 K3 CO4

35. a) A 50 Hz, 11 KV, 3 phase alternator with earthed neutral has a reactance of 5 ohms per phase and is connected to bus bar through a CB. The distributed capacitance up to CB between phase and neutral is $0.01\mu\text{f}$.determine (i) peak restriking voltage across the contacts of the breaker. (ii) Frequency of oscillation. (iii) The average rate of rise of re striking voltage up to the first peak. 10 K2 CO5

(OR)

- b) Describe the constructional details of SF₆ circuit breaker and its operation. Give its advantages and disadvantages. 10 K2 CO5

36. a) i) Compare the static relay with electromagnetic relays. 5 K2 CO4
ii) Write short notes on the working of current chopping with suitable diagrams. 5 K2 CO5

(OR)

- b) i) Explain the steps involved in algorithm development for fault diagnosis. 5 K2 CO4
ii) Briefly explain the working principle and construction of Miniature Circuit Breaker (MCB). 5 K2 CO5