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Seventh Semester B.E. Degree Examination, Aug./Sept.2020 Power System Protection

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. With a neat sketch, explain different zones of protection in Power system. (05 Marks)
- b. Explain the concept of primary and back up protection. (05 Marks)
- c. Describe any six essential qualities of a protective relay. (06 Marks)

OR

- 2 a. Derive an expression for torque produced by an induction relay. (05 Marks)
- b. Discuss how an amplitude comparator can be converted to a phase comparator and vice versa. (06 Marks)
- c. The current ratings of an over current relay is 5A. It has a PSM = 2, TSM = 0.3, CT ratio = 400/5, fault current = 4000A. Determine the time of operation of various PSM. Assuming normal IDMT characteristics. (05 Marks)

Plug Setting Multiplier (PSM)	2	4	5	6	8	10	20
Operating time in seconds	10	5	4	3.5	3	2.8	2.4

Module-2

- 3 a. With a neat sketch, explain the construction and working principle of a reverse power or directional relay. (07 Marks)
- b. Discuss the protection scheme for parallel feeder. (05 Marks)
- c. List out the advantages of static relays over electromagnetic relays. (04 Marks)

OR

- 4 a. Explain the working principle, torque equation and operating characteristics of impedance relay. (08 Marks)
- b. Write short note on:
 - i) Effect of Arc Resistance on the performance of Distance Relays.
 - ii) Effect of power surges (power swings) on the performance of Distance Relays. (08 Marks)

Module-3

- 5 a. Define the term 'Pilot' with reference to power line protection. List the different type of wire pilot protection schemes and explain for any one the scheme. (08 Marks)
- b. Explain the working with neat sketch of following differential relays:
 - i) Current differential relay
 - ii) Voltage balance differential relay. (08 Marks)

OR

- 6 a. With the help of neat diagram, explain Merz-Price protection of star connected alternator stator windings. Mention its advantages. (08 Marks)
- b. Write short notes on:
- Buchholz Relay
 - Differential scheme for bus-zone protection. (08 Marks)

Module-4

- 7 a. Discuss the recovery rate theory and energy balance theory of arc interruption in AC Circuit Breaker. (07 Marks)
- b. With a neat sketch and waveform explain the interruption of capacitive current. (05 Marks)
- c. Explain the terms:
- Restriking voltage
 - RRRV (Rate of Rise of Restriking Voltage). (04 Marks)

OR

- 8 a. With a neat sketch, explain the working of axial blast circuit breaker. (07 Marks)
- b. State the advantages and disadvantages of SF₆ circuit breaker. (05 Marks)
- c. Write short notes on HVDC circuit breaker. (04 Marks)

Module-5

- 9 a. With a neat sketch, explain the HRC fuse and list its advantages and disadvantages. (06 Marks)
- b. Describe with neat sketch of Klydonograph Instrument used for the measurement of surge voltage. (06 Marks)
- c. Explain the terms:
- Protective ratio
 - Protective angle. (04 Marks)

OR

- 10 a. With a neat diagram, explain and working of
- Rod gap arrester
 - Expulsion type arrester. (08 Marks)
- b. Write short notes on:
- Insulation co-ordination
 - Gas Insulated Substation (GIS). (08 Marks)
