CBCS SCHEME

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17EE72

Seventh Semester B.E. Degree Examination, Jan./Feb.2021
Power System Protection

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. With a neat diagram, explain zones of protection in a power system. **(06 Marks)**
b. Derive an expression for torque produced by an induction relay. **(08 Marks)**
c. List the merits and demerits of static relays. **(06 Marks)**

OR

2 a. Draw a neat sketch of an induction disc relay and discuss its operating principle. **(07 Marks)**
b. What are the various types of over current relays? Discuss their area of applications. **(06 Marks)**
c. Describe the realization of a overcurrent relay using numerical technique. Show its flowchart with neat diagram. **(07 Marks)**

Module-2

3 a. With a neat schematic diagram, explain the construction and working of static reactance relay using an amplitude comparator. **(08 Marks)**
b. With a neat sketch, explain the construction and working principle of induction disc type reverse power relay. **(08 Marks)**
c. With neat diagram, explain induction cup type impedance relay. **(04 Marks)**

OR

4 a. Draw and explain the circuit connections of three MHO units used at a particular location for three zones of protection. **(07 Marks)**
b. With neat connection diagrams, explain the working of directional earth fault relay. **(07 Marks)**
c. With neat diagram, explain static impedance relay using amplitude comparator. **(06 Marks)**

Module-3

5 a. With neat diagram, explain percentage differential protection of star-delta connected transformer. **(08 Marks)**
b. With neat diagram, explain the working of Buccholz relay. **(05 Marks)**
c. An 11 kV, 150 MVA alternator is provided with differential protection. The percentage of winding to be protected against phase to ground fault is 80%. The relay is set to operate when there is 20% out of balance current. Determine the value of the resistance to be placed in the neutral to ground protection. **(07 Marks)**

OR

6 a. Define the term 'pilot' with reference to power line protection. List the different types of wire pilot protection schemes and explain any one of the schemes. **(08 Marks)**
b. With neat diagram, explain harmonic restraint relay used to protect against magnetizing inrush current of transformer. **(08 Marks)**
c. With a neat circuit diagram, explain rotor earth fault protection of alternator. **(04 Marks)**

Module-4

7 a. In a 132 kV system, reactance and capacitance upto the location of the circuit breaker is 4Ω and 0.02 μF respectively. A resistance of 500 Ω is connected across the break of the C.B. Determine the (a) natural frequency of oscillation (b) damped frequency of oscillation. (c) critical value of resistance. **(08 Marks)**

b. Explain working of SF_6 circuit breaker with the help of diagrams. Write two of its advantages. **(08 Marks)**

c. Explain recovery rate theory to explain the zero current interruption of the arc. **(04 Marks)**

OR

8 a. Derive expressions for restriking voltage and RRRV in terms of system voltage, inductance and capacitance during fault on feeder. **(08 Marks)**

b. With neat circuit diagram, explain the synthetic testing of circuit breaker. **(06 Marks)**

c. With neat diagram, explain Air-break circuit breaker. Write any two of its applications. **(06 Marks)**

Module-5

9 a. Describe the construction and operation of the HRC cartridge fuse with indicator. Write any four of advantages of HRC fuses. **(08 Marks)**

b. Describe the phenomenon of lightning and explain the terms pilot streamer, stepped leader, return streamer, dart leader, cold lightning stroke and hot lightning stroke. **(08 Marks)**

c. Write short note on Arcing horn with diagram. **(04 Marks)**

OR

10 a. Describe the construction and principle of operation of valve type lightning arrester with detailed diagram. **(08 Marks)**

b. Write note on klydonograph and magnetic link. **(06 Marks)**

c. Describe the protection of stations and sub-stations against direct lightning strokes. **(06 Marks)**

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