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10EE62

**Sixth Semester B.E. Degree Examination, Jan./Feb.2021**  
**Switch Gear and Protection**

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting at least TWO questions from each part.**

**PART – A**

- 1 a. Explain with the neat sketch, the construction and working principle of HRC fuse list advantages and disadvantages. (10 Marks)
- b. Explain the difference between isolating switch and load switch. (05 Marks)
- c. Draw the block diagram of energy management of power system and explain. (05 Marks)
  
- 2 a. Discuss the recovery rate theory and energy balance theory of arc interruption in a.c. circuit. (08 Marks)
- b. Explain the phenomenon of inductive current chopping in circuit breaker. (05 Marks)
- c. For a 132 KV system the reactance and capacitance upto location of circuit breaker is  $3 \Omega$  and  $0.015 \mu\text{F}$  respectively, calculate the following:
  - (i) Frequency of transient oscillation.
  - (ii) Maximum value of restriking voltage across the contacts of the circuit breaker.
  - (iii) Maximum value of rate of rise restriking voltage. (07 Marks)
  
- 3 a. Describe the working principle of SF6 circuit breaker with help of neat sketch, mention advantages over other types of circuit breaker. (10 Marks)
- b. With a neat sketch, explain the construction and working of air circuit breaker with reference to,
  - (i) Axial blast.
  - (ii) Cross blast. (10 Marks)
  
- 4 a. With neat diagram, explain the short circuit test on circuit breaker. (06 Marks)
- b. Explain in detail synthetic testing of circuit breaker. (08 Marks)
- c. Explain basic principle of operation of lightning arrestors. (06 Marks)

**PART – B**

- 5 a. State and explain briefly the characteristics of good protective relay. (08 Marks)
- b. Explain the concept of primary and backup relay. (06 Marks)
- c. With neat diagram, explain the zones of protection in a typical power system. (06 Marks)
  
- 6 a. Explain the working principle and characteristics of an impedance relay with R-X diagram. (07 Marks)
- b. With a neat sketch, explain the construction and working of Buchholz relay. (08 Marks)
- c. Determine the actual time of operation of a 5 ampere 3 second over current relay having a current setting of 125% and a time multiplier of 0.6 connected to supply circuit through a 400/5 CT when the circuit carries a fault current of 4000 A. Time of operation is 3.5 second for the estimated value of PSM. (05 Marks)

Important Note: 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and/or equations written eg.  $42+8=50$ , will be treated as malpractice.

- 7 a. Explain the Merz-Price protection for Y-connected alternator. What are advantages of this protection? (10 Marks)
- b. What do you mean by phase fault and ground fault with respect to 3-phase induction motor? How the motor is protected against such fault? (10 Marks)
- 8 a. Explain with basic circuit diagram harmonic restraint relay protection for transformer. (10 Marks)
- b. The natural point of a 11 KV alternator is earthed through a resistance of  $12 \Omega$  the relay is set to operate when there is out of balance of 0.8 A. The CTS have a ratio of 2000/5. What percentage of the winding is protected against earth fault? What must be the minimum value of earthing resistance required to give 90% of protection of each phase. (10 Marks)

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