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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 Ω and 0.015 µF 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)**

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 Ω 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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