Roll No .....

EX-603

B.E. VI Semester

Examination, June 2013

Switchgear and Protection

Time : Three Hours

Maximum Marks : 100 *Minimum Pass Marks :35*

Note: Attempt any five questions. Assume suitable value for missing data, if any.

1. a) Explain the terms : Restriking voltage, recovery voltage and RRRV. Derive the expression for restriking voltage and RRRV.
   b) What is the arc interruption methods. Discuss the recovery rate theory and energy balance theory of arc interruption.

2. a) For a 132kV system, the reactance and capacitance up to the location of the circuit breaker is 3 ohms and 0.015 μF respectively. Calculate the following:
      i) The frequency of transient oscillations.
      ii) The max. Value of restriking voltage
      iii) The max. Value of RRRV.
   b) Explain the HRC cartridge fuse in detail. What are its advantages and disadvantages?

3. a) Describe the Vacuum circuit breaker in detail with neat sketches.
   b) Explain the construction and working of SF_6 Circuit breaker. What are the physical, chemical and dielectric properties of SF_6 gas.

4. a) Describe different types of Induction relays. Derive the torque equation and show how different time and current settings can be obtained from it.
   b) What are the essential qualities of protection in a protective system? Discuss various zones of protection.

5. a) Describe the operating principal and constructional features of a directional relay. Draw 30° and 90° connection of directional relay.
   b) The current setting of a relay is 5 Amp, PSM = 1.5, TMS = 0.2, C T. ratio = 400/5, Fault current = 6000 Amp. Determine the operating time of relay.
   At TMS = 1, operating time at various PSM are :

PSM	2	4	5	8	10	20
Op.Time(sec.)	10	5	4	3	2.8	2.4

6. a) Describe with neat sketches, the percentage differential protection scheme of the 3-phase alternator.
   b) Discuss the operating principle of impedance relay with its characteristics.

7. a) Explain these relays in detail.
      i) MHO relay ii) Buchholz relay
   b) The neutral point of a three phase 20 MVA, 11kV alternator is earthed through a resistance of 5 ohms. The relay is set to operate when there is out of balance current of 1.5 Amp.
   The CTs have a ratio of 1000/5. Calculate what percentage of winding is protected against an earth fault.

8. Write short notes on the following : (any four):
   i) Insulation coordination.
   ii) Basic impulse insulation level.
   iii) Surge absorber.
   iv) Time graded system and current graded system.
   v) Current limiting reactors.
   vi) Static relays.

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