USN ☐☐☐☐☐☐☐☐☐☐ **10EE62**

Sixth Semester B.E. Degree Examination, Dec.2015/Jan.2016
Switchgear 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 the construction and working of a HRC fuse with a neat sketch. List the advantages and disadvantages. **(10 Marks)**
   b. Write a short note on energy management of power. **(05 Marks)**
   c. Explain difference between isolating switch and load breaking switch. **(05 Marks)**

2 a. What is Resistance switching? Derive an expression for critical value of resistance to be added to circuit breaker. **(08 Marks)**
   b. Explain in detail, two theories of arc interruption in circuit Breakers. **(06 Marks)**
   c. In a 132KV system, the reactance and capacitance up to the location of the circuit breaker is 3Ω and 0.015 respectively. Calculate the following :
      i) The frequency of transient oscillation
      ii) Maximum value of restriking voltage across the contacts of the circuit Breaker and
      iii) Maximum value of rate of rise restriking voltage. **(06 Marks)**

3 a. Explain the working of an air blast circuit breaker with reference to
      i) Axial blast   ii) Cross blast **(12 Marks)**
   b. Explain the properties of SF_6 gas. **(08 Marks)**

4 a. With a neat diagram explain the short circuit test on circuit breaker. **(08 Marks)**
   b. With a neat diagram, explain any one type of synthetic testing of circuit Breaker. **(06 Marks)**
   c. Explain the phenomenon of lightning discharge. **(06 Marks)**

PART – B

5 a. Explain the concept of primary and back up protection. **(06 Marks)**
   b. What are the essential qualities of a protective relay? Explain them briefly. **(10 Marks)**
   c. What is Relay? Define : i) Pickup level ii) burden iii) dropout with respect to relays. **(04 Marks)**

6 a. With a neat sketch, explain the working of induction type directional over current relay. **(10 Marks)**
   b. Explain with a neat circuit, the working of voltage balance differential relay. **(05 Marks)**
   c. Explain the working principle of an impedance Relay. **(05 Marks)**

7 a. Draw and explain the Merz – Price protection of alternator stator windings, state its advantage (Y and Δ connected alternators). **(10 Marks)**
   b. A 6.6KV, star connected alternator has a transient reactance of 2Ω per phase and negligible winding resistance. It is protected by circulating current Merz – Price protection. The alternator neutral is earthed through the resistance of 7.5Ω. The relays are set to operate when there is out of balance current of 1 ampere in secondary of 500/5 amper current transformers. How much % of winding is protected against earth fault? **(10 Marks)**

8 a. With the basic circuit diagram, explain the harmonic restraint relay protection for a transformer. **(08 Marks)**
   b. Explain single phasing in induction motors. How motor is protected from single phasing. **(08 Marks)**
   c. List the various abnormal conditions against which large induction motor has to be protected. **(04 Marks)**

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