Sixth Semester B.E. Degree Examination, June-July 2009
Switch Gear and Protection

Time: 3 hrs.

Max. Marks:100

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

PART – A

1 a. Mention the role of fuse, Isolator, Lad Breaking switch and Earthing switch in a power system network. (08 Marks)
   b. With a neat sketch describe the working of a liquid fuse. (06 Marks)
   c. Explain with neat sketch in brief the construction and working of a HRC fuse. (06 Marks)

2 a. Explain how arc is initiated and maintained in a circuit breaker, when its contact separate. (07 Marks)
   b. Discuss the factors on which Restriking voltage depends. (05 Marks)
   c. In a 220 kV system, the reactance and capacitance up to the location of circuit breaker is 8Ω and 0.025 µf respectively. A resistance of 600 µ is connected across the contacts of the circuit breaker. Calculate the following.
   i)   Natural frequency of oscillation.
   ii)   Damped frequency of oscillation.
   iii) Critical value of resistance which will give no transient oscillation.
   iv)   The value of resistance which will give damped frequency of oscillation, $1/4^{th}$ of the natural frequency of oscillation. (08 Marks)

3 a. Discuss the phenomenon of current chopping in circuit in circuit breaker. (10 Marks)
   b. With neat sketch explain the working of Air break circuit breaker. (10 Marks)

4 a. Discuss the properties of sulphur hexafluoride (Sf_6) gas that makes it superior for application in circuit breaker. (06 Marks)
   b. Explain the construction, working, advantages of vaccum circuit breaker. (10 Marks)
   c. Explain briefly synthetic testing of circuit breaker. (04 Marks)

PART – B

5 a. Discuss the various essential qualities of a protective relay. (08 Marks)
   b. With a neat sketch, explain the construction and working of directional type over current relay. (12 Marks)

6 a. With neat sketch, explain the working principle and operating characteristics of a percentage biased differential relay. (10 Marks)
   b. With neat sketch, explain the working principle and operating characteristics of a – Distance type Impedance relay. (10 Marks)

7 a. Discuss the important faults of an alternator. (10 Marks)
   b. A star connected, 3 – phase, 10 MVA, 6.6kV alternator is protected by Merz – Price circulating current principle using 1000/5 amperes current transformers. The star point of the alternator is earthed through a resistance of 7.5Ω. If the minimum operating current for the relay is 0.5 A. Calculate the percentage of each phase of the stator winding which is unprotected against earth faults when the machine is operating at normal voltage. (10 Marks)

8 a. With the help of a neat sketch, explain the working of a Buchholz relay for transformer protection. (10 Marks)
   b. In connection with 3 – phase Induction motor protection, what do you mean by single phasing and phase Rexersal? What is the effect of it and how it is protected? (10 Marks)

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