



**VII Semester B.E. (E & E) Degree Examination, Jan./Feb. 2014
(2K6 Scheme)**

EE-703: SWITCH GEAR AND PROTECTION

Time : 3 Hours

Max. Marks : 100

Instruction : Answer any five full questions selecting at least two from each Part.

PART – A

1. a) Draw the single line diagram of a substation. **6**
b) Differentiate between load break switch and isolating switch. **4**
c) Explain the cut-off characteristics and Time-current characteristics of a fuse. **10**
2. a) Derive an expression for short circuit current in R-L series with an A.C. source. Show that the current has D.C. component and AC component. **10**
b) Define the term restriking voltage, derive an expression for RRRV, max. RRRV and frequency of oscillation of Restriking voltage for circuit breaker. **10**
3. a) With a neat sketch, explain the following air blast circuit breakers, (i) Cross blast type, (ii) Axial blast type. **10**
b) Explain the phenomena which are due to the interruption of capacitive currents. **10**
4. a) With a neat sketch, explain the working of a single pressure puffer type SF₆ circuit breaker. **6**
b) Write explanatory note on : (i) Unit testing (ii) Synthetic testing of circuit breakers. **8**
c) A circuit breaker is rated as 2000A, 1500MVA, 33 KV, 3ph, 3 seconds, oil circuit breaker (OCB) determine ; (i) Rated normal current, (ii) Rated symmetrical breaking current, (iii) Rated making current, (iv) Short time rating, (v) The type of breaker used. **6**



PART – B

5. a) What is a protective relay ? Discuss the basic requirements of protective relaying. **8**
- b) Explain with a neat sketch the construction and working of non-directional induction type over current relay ? Also derive an expression for the Torque produced by an Induction Relay. **12**
6. a) If the current rating of relay is 5A, PSM = 1.5, TMS = 0.4, C.T. ratio = 400/5, fault current = 6000 A, determine the operating time of the relay. AT TMS = 1, operating time at various PSM are : **5**
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|----------------------|----|---|---|---|-----|-----|
| PSM | 2 | 4 | 5 | 8 | 10 | 20 |
| Operating time, sec. | 10 | 5 | 4 | 3 | 2.8 | 2.4 |
- b) Explain the working principle and characteristics of an Impedance Relay with R, X diagram ? **8**
- c) Differentiate between IDMT over current relay and extremely inverse-time over current relay characteristics. **7**
7. a) With a neat sketch diagram explain the working of a Buchholz's relay. **8**
- b) Explain briefly with block diagram of a microprocessor based over current relay. **8**
- c) Define TMS and PSM. **4**
8. Write short notes on :
- a) Vacuum circuit breaker
 - b) Fuse and Fuse material
 - c) Ground fault protection of Induction motor
 - d) Concept of zones of protection used in protection of large power systems. **20**
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