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**B.E./B.Tech DEGREE END SEMESTER EXAMINATIONS APR/MAY. 2013
COLLEGE OF ENGINEERING GUINDY CAMPUS, ANNA UNIVERSITY, CHENNAI
ELECTRICAL AND ELECTRONICS ENGINEERING BRANCH**

**Fifth Semester
EE 9306 Protection and Switchgear
(Regulations 2008)**

Time: 3 Hours

Max. Marks: 100

Answer ALL questions
PART – A (10 x 2 = 20 Marks)

1. Draw a neat diagram for different zones of protection.
2. What are adverse effects of short circuit in a Power System?
3. Why time delay is intentionally provided in practical relays?
4. What is the significance of Universal torque equation
5. What is the role of auxiliary relay in Merz-price protection?
6. How the protection against loss of excitation is provided in generators?
7. What are the different processes of ionization?
8. Why interruption of capacitive currents is a problem?
9. List the advantages of SF₆ circuit breakers.
10. Why current chopping occurs in air circuit breakers

PART – B (5 x 16 = 80 Marks)

11. (i) What are the different types of faults in a Power System. **(6 marks)**
(ii) Using symmetrical component method obtain an expression for fault current and phase voltage at fault current for a Double-line to ground fault. **(10 marks)**

12. a. With neat diagram explain the working principle of a directional over-current relay and hence derive an expression for torque equation **(16 marks)**

(OR)

- b. Explain the working of following relays.
 - (i) Definite distance type impedance relay **(8 Marks)**
 - (ii) Reactance relay. **(8 Marks)**

13. a. Explain in detail the different types of fault in a transformer and the protective scheme against each fault. **(16 marks)**

(OR)

- b. (i) Explain the time graded over-current protection of ring main feeder. **(6 marks)**

(ii) A star-connected, 3-phase, 20MVA, 6.6kV alternator has a per phase reactance of 20%. It is protected by Merz-Price circulating-current principle which is set to operate for fault currents not less than 150A. Calculate the value of earthing resistance to be provided in order to ensure that only 15% of the alternator winding remains unprotected. **(10 marks)**

14. a. (i) Explain the factors affecting the transient recovery voltage. **(6 marks)**

(ii) Obtain an expression of rate of rise of re-striking voltage. **(10 marks)**

{OR}

b. Explain with suitable theories the arcing phenomena and arc interruption in a circuit breaker. **(16 marks)**

15. a. Explain with neat diagrams the type, working and merits of oil circuit breaker. **(16 marks)**

{OR}

b. Explain with neat diagrams the type; working and merits of air circuit breaker. **(16 marks)**
