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Question Paper Code : 23432

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Fifth Semester

Electrical and Electronics Engineering

EE 1302 — PROTECTION AND SWITCHGEAR

(Regulation 2004/2007)

(Common to B.E. (Part-Time) Fourth Semester, Regulation 2005)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Why is it necessary to protect the equipment and lines against over voltages?
2. Classify the types of faults in a power system.
3. State the limitations of differential relays.
4. What is MHO relay? Draw its operating characteristics on an R-X diagram.
5. Mention the likely causes of failures of outdoor bus bars.
6. Define "Burden" of a CT? How is it specified.
7. What do you mean by current chopping?
8. What are the methods of capacitive switching?
9. Write the indirect methods of circuit breaker testing.
10. Compare the performance of Air Blast Circuit Breaker with Oil Minimum Circuit Breaker.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive the 3 phase power in terms of symmetrical components. (8)
(ii) Discuss the role of backup protection and explain how the backup protection is achieved in graded time over current protection of transmission lines. (8)

Or

- (b) (i) Illustrate the protective zones in a generating station with a neat diagram. (8)
(ii) A short circuit to earth occurs near the terminals of phase A of a 3 phase alternator, star connected with neutral point earthed, and the current to the earth being 100 amps. If the alternator is not supplying any normal current, calculate the positive, negative and zero sequence components of currents of all phases. (8)
12. (a) (i) Derive the universal torque equation. (4)
(ii) Explain with sketches the construction and operation of induction type over current relay. Also derive the equation for the torque developed by such a relay. (12)

Or

- (b) (i) Discuss the desirable qualities of protective relaying. (6)
(ii) Discuss the advantages and disadvantages of static relays as protective devices. (10)
13. (a) (i) Describe the operation of Buchholz relay with diagram. (8)
(ii) Describe the protective scheme for internal faults in a 3 phase delta/star connected power transformer. (8)

Or

- (b) (i) Explain the protection of stator windings of a 3 phase alternator against turn to turn fault. (10)
(ii) A 3 phase 11/6.6 kV star/delta transformer is protected by means of differential protection system. If the CTs on LV side have the ratio of 600/5 A. Determine the ratio of CTS on HT side. (6)
14. (a) (i) Discuss the physics of arc phenomena. (8)
(ii) Derive an expression for restriking voltage and rate of rise of restriking voltage (RRRV) in terms of system voltage of the circuit breaker. (8)

Or

- (b) (i) Discuss the problem associated with the interruption of low inductive current and capacitive current. (10)
- (ii) Explain the arc extinction process in an alternating current circuit breaker. (6)
15. (a) Give the properties of SF6 and explain the construction and working principle of SF6 circuit breaker with a neat diagram. (16)

Or

- (b) Describe the procedure of direct testing of three phase circuit breaker for short circuit. Explain how is the making capacity, breaking capacity and short time capacity determined? (16)
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