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R 3342

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

Fifth Semester

(Regulation 2004)

Electrical and Electronics Engineering

EE 1302 — PROTECTION AND SWITCHGEAR

(Common to BE (Part-Time) Fourth Semester Regulation 2005)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the causes of faults in power system?

2. What are the different types of faults in power system transmission lines?

3. What type of relay is best suited for long distance very high voltage transmission lines?

4. What type of relay is best suited for generator protection?

5. What are the different protection schemes used in bus-bars?

6. What are the applications of CTs and PTs in power system?

7. Define recovery voltage in circuit breakers.

8. Define restriking voltage in circuit breakers.

9. What are the types of circuit breakers?

10. Write any two advantages of SF_6 circuit breaker.

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PART B — (5 × 16 = 80 marks)

11. (a) (i) What are the different types of earthing made in power system? Give the circuit diagram for Arc-suppression coil earthing and explain its principle. (3 + 5)

(ii) Six 6.6 kv, 3 phase alternators are connected to a common set of bus bars. Each has positive, negative and zero sequence reactances of 0.90 ohm, 0.72 ohms and 0.30 ohms respectively. An earth fault occurs on one bus bar. Determine the value of fault current if all alternator neutrals are solidly grounded. (8)

Or

(b) (i) What are the basic requirement of a protective relaying? (6)

(ii) What are the causes of short circuits due to failure of insulation on overhead conductors? (5)

(iii) Draw the sequence network for a double-line-to-ground fault at the terminals of an unloaded alternator to find fault current interms of equivalent sequence impedances. (5)

12. (a) Draw and explain the operating principle of non-directional over-current relay or earth leakage (induction type) relay. (16)

Or

(b) Draw the schematic of an admittance relay and also the operating characteristic of Mho type distance relay. Derive its torque equation and condition for its operation. (16)

13. (a) Draw the "Merz Price circulating current protection scheme" for the protection of alternator against stator faults (phase to phase and phase to ground) and explain its operation. Explain why 100% of winding of alternator can not be protected using this method with earthing resistance to limit the fault current. Explain the modified protection scheme to provide greater sensitivity in the event of earth fault on the stator winding. (6 + 4 + 6)

Or

(b) (i) Explain a biased differential protection scheme applied to 3 phase transformer with diagram. Also tabulate the different types of CT connections used for different types of transformer primary and secondary winding connections. (6 + 4)

(ii) A 3 phase power transformer has a voltage ratio of 33/6.6 kv and is star delta connected. The protective CTs on the 6.6 kV side have a current ratio of 100 : 1. What must be the ratio of protective CTs on the 33 kV side? (6)

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14. (a) (i) Explain the arc interruption methods used in circuit breakers. (8)

(ii) Explain resistance switching for arc extinction in circuit breakers. (8)

Or

(b) (i) Draw the schematic of a HVDC circuit breaker and explain its functioning.

(ii) Explain the problem of direct current interruption. (10 + 6)

15. (a) Describe the constructional details of SF_6 circuit breaker and its operation. Give its advantages and disadvantages. (10 + 6)

Or

(b) Explain the various tests conducted on circuit breakers. (16)

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