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B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2006.

Fifth Semester

Electrical and Electronics Engineering

EE 1302 – PROTECTION AND SWITCH GEAR

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

(Regulation 2004)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write any two functions of protective relaying.

2. What are the desirable qualities of protective relaying?

3. For what purpose distance relay is used?

4. Give any two advantages of static relays over electromagnetic relays.

5. What are the two types of protection given for bus-bars?

6. What is the meaning of burden on C.T.?

7. Define recovery voltage.

8. Define rate of rise of restriking voltage.

9. Write any two merits of vacuum circuit breakers.

10. List the routine tests conducted on circuit breakers.

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PART B — (5 × 16 = 80 marks)

11. (a) (i) Draw the protective zone diagram for a sample power system network and explain its rules. (8)

(ii) A 3 phase 11 KV, 25000 KVA alternator with $X_{g0} = 0.05$ p.u., $X_1 = 0.15$ p.u. and $X_2 = 0.15$ p.u. is grounded through a reactance of 0.3 ohms. Calculate the line current for a single line to ground fault. (8)

Or

(b) (i) List the causes of faults in different equipments in a sample system. (8)

(ii) Explain Arc-suppression coil earthing with diagram. (8)

12. (a) (i) Draw the constructional details of non-directional Induction Relay. (8)

(ii) Draw and explain the schematic of an impedance relay and its operating characteristic on R – X diagram. (8)

Or

(b) (i) Explain the principle of current differential relay with diagrams. (8)

(ii) List the advantages and disadvantages of static relays. (8)

13. (a) (i) What are the faults that may occur on an alternator? Give the diagram for circulating current protection in alternator. (8)

(ii) A 5,000 KVA, 6,600 V star-connected alternator has a synchronous reactance of 2 ohm per phase and 0.5 ohm resistance. It is protected by a Merz Price balanced current system which operates when the out of balance current exceeds 30% of the load current. Determine what proportion of the alternator winding is unprotected if the star-point is earthed through a resistor of 6.5 ohms? (8)

Or

(b) (i) Draw a diagram of connections of the Merz Price circulating current system for protection of a 1000 KVA, 11000/400 volt delta/star 3-phase transformer with the star point connected to ground and mark on the diagram the turns ratios of the CTs for a nominal 5A secondary current. (8)

(ii) Draw and explain protection scheme of an A.C. induction motor 3 phase. (8)

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14. (a) (i) Explain the arc phenomena for initiation of arc, maintenance of arc and the methods used for interrupting the arc. (8)

(ii) From the following data of a 50 Hz generator; emf to neutral 7.5 KV (rms), reactance of generator and connected system 4 ohms, distributed capacitance to neutral 0.01 μF, resistance negligible; find (1) the maximum voltage across the contacts of circuit breaker when it breaks a short-circuit current at zero current, (2) the frequency of the transient oscillation and (3) the average rate of rise of voltage upto the first peak of the oscillation. (8)

Or

(b) (i) Show schematic arrangement of a breaker with a resistor connected across the contacts and its Laplace equivalent. (8)

(ii) Draw a schematic of a HVDC circuit breaker and explain its working. (8)

15. (a) Show the constructional layout of SF_6 breaker and give its advantages and disadvantages. (16)

Or

(b) Show sectional view of working portion of a typical low-oil circuit breaker (one phase). (16)

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