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THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION OCTOBER 2012

Electrical Engineering

AI 09 304—ELECTRICAL ENGINEERING

(2009 Admissions)

Time : Three Hours

Maximum : 70 Marks

Part A

Answer all questions.

1. How are DC motors classified ?

2. A 20 kVA, 50 Hz, 2000/200 V single phase distribution transformer draws 120 W and 300 W respectively on O.C. test (H.V. open) and S.C. test (L.V. short-circuited) respectively. If the L.V. side is loaded fully at 0.8 p.f. lagging, calculate the efficiency of the transformer.

3. What is a conservator ? What is the purpose of using it in a transformer set up ?

4. Which type of rotor is used in high speed (turbo) alternators ? Why ?

5. How many coils are present in a Electrodynamometer Wattmeter ? What are they ? Explain their constructional difference.

$(5 \times 2 = 10 \text{ marks})$

Part B

Answer any four questions.

6. Find the efficiency of a long shunt compound generator rated at 250 kW, 230 V when supplying 76% of rated load at rated voltage. The resistance of the armature and series field are 0.009Ω and 0.003Ω. The shunt field current is 13 Amps. When the machine is run as a motor at no-load the armature current is 25A at rated voltage ?

7. A 200 V shunt motor has $R_a = 0.1 \Omega$, $R_f = 240 \Omega$ and rotational loss 236 W. On full load, the line current is 9.8 A. With the motor running at 1450 r.p.m. Determine :

    (a) The mechanical power developed.

    (b) Power output.

    (c) Load torque.

    (d) Full-load efficiency.

8. Explain with neat diagram any one connection of a three phase transformer.

9. Prove that the mechanical power output is a fraction (1–s) times of the total power delivered to the rotor in a three phase induction motor with the appropriate equations.

10. Brief any *two* types of errors that occur frequently in electrodynamometer type instruments.

11. Brief on 'Phantom Loading' effect that occurs in an energy meter.

$(4 \times 5 = 20 \text{ marks})$
Turn over

Part C

Answer Section (a) or Section (b) of each question.

12. (a) (i) Explain in detail the two methods of speed control adopted in d.c. shunt motors.

    (8 marks)

    (ii) What do you understand by the term 'Speed regulation'?

    (2 marks)

    Or

    (b) (i) The following test results are obtained while Swinburne's test is performed on a d.c. shunt machine with the supply voltage of 200 V. At no-load the input power is 1.1 kW, the current is 5.5 Amps and the speed is 1150 r.p.m. when the m/c is run as a motor. Calculate the efficiency of the machine as generator and feeding a load of 50 Amps. Armature resistance is 0.6 Ω and shunt field resistance is 110 Ω.

    (8 marks)

    (ii) What are the necessary and sufficient conditions to be satisfied for parallel operating two shunt generators?

    (2 marks)

13. (a) A 50 kVA, 2200/110 V transformer when tested gave the following results :

    O.C. test measurements on L.V. side :   400 W, 10 A, 110 V.

    S.C. test measurements on H.V. side :   808 W, 20.5 A, 90 V.

    Compute all the parameters of the equivalent circuit referred to the H.V. and L.V. sides of the transformer. Also calculate the percentage voltage regulation and efficiency at full load and 0.8 p.f. lagging.

    (10 marks)

    Or

    (b) (i) Brief on Bucholz Relay.

    (4 marks)

    (ii) Explain in detail the construction of Core-type of transformer with suitable diagrams.

    (6 marks)

14. (a) (i) Explain the slip power recovery scheme of speed control of slip-ring Induction motor.

    (8 marks)

    (ii) What are the advantages of Squirrel-cage rotor upon slip-ring induction rotor?

    (2 marks)

    Or

    (b) Explain the Synchronous impedance method of predetermination of the voltage regulation of a three phase alternator.

    (10 marks)

15. (a) Explain in detail the errors that are possible to occur in Electrodynamometer type wattmeters.

(10 marks)

Or

(b) Write notes on :

    (i) Lag adjustment ; and

    (ii) Creep

in a single phase Induction type energy meter.

(10 marks)

[4 × 10 = 40 marks]