

[This question paper contains 2 printed pages.]

Sr. No. of Question Paper : 1101

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Your Roll No.....

Unique Paper Code : 251601

Name of the Course : **B.Sc. (Hons.) Electronics**

Name of the Paper : Electrical Machines

Semester : VI

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **FIVE** questions in all.
3. Question 1 is compulsory.
4. Use of Scientific Calculator is allowed.

1. (a) State the different kinds of losses in a d.c. generator. (3)
(b) A series motor should not be started without load. Justify. (3)
(c) What is the general principle of operation of induction motors ? (3)
(d) What is Slip ? What is its value at synchronous speed ? (3)
(e) What are the advantages of an autotransformer ? (3)
2. (a) Derive the E.M.F. equation of a d.c. generator. (5)
(b) A long-shunt compound generator delivers a load current of 50 A at 500 V and has armature, series field and shunt field resistances of 0.05Ω , 0.03Ω and 250Ω , respectively. Calculate the generated voltage and the armature current. Allow 1 V per brush for contact drop. (5)
(c) Explain with a diagram how does the voltage builds up in a shunt generator ? (5)
3. (a) State the voltage equation of a d.c. motor. What is the significance of back E.M.F. in d.c. motor. (4)

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- (b) Determine developed torque and shaft torque of 220-V, 4-pole series motor with 800 conductors wave-connected supplying a load of 8.2 kW by taking 45 A from the mains. The flux per pole is 25 mWb and its armature circuit resistance is 0.6Ω . (5)
- (c) Explain the Ward-Leonard method for speed control of d.c. motor. (6)
4. (a) Explain the equivalent circuit of practical transformer. (6)
- (b) Explain the transformer short circuit tests. (5)
- (c) A 50-kVA, 4,400/220-V transformer has $R_1 = 3.45$ ohm, $R_2 = 0.009$ ohm. The values of reactances are $X_1 = 5.2$ ohm and $X_2 = 0.015$ ohm. Calculate for the transformer (i) equivalent resistance as referred to primary (ii) equivalent resistance as referred to secondary (iii) equivalent reactance as referred to both primary and secondary (iv) equivalent impedance as referred to both primary and secondary. (4)
5. (a) Show that total power in both delta and star 3 phase system for balanced load conditions is given by the same expression. (5)
- (b) Three equal star-connected impedance take 8 kW at a power factor 0.8 when connected across a 460 V, 3-phase, 3-wire supply. Find the circuit constants (resistance and reactance) of the load per phase (5)
- (c) Give the advantages and disadvantages of Poly-phase induction motors. (5)
6. (a) A 4-pole, 3-phase induction motor operates from a supply whose frequency is 50 Hz. Calculate :
- (i) The speed at which the magnetic field of the stator is rotating.
 - (ii) The speed of the rotor when the slip is 0.04.
 - (iii) The frequency of the rotor currents when the slip is 0.03.
 - (iv) The frequency of the rotor currents at standstill. (5)
- (b) Explain the rotating mechanism of the rotor in induction motor. (5)
- (c) Derive the expression of running torque of an induction motor. (5)
7. (a) List the characteristic features of a synchronous motor. (5)
- (b) How is a single phase induction motor made self-starting ? (5)
- (c) Explain the principle of operation of repulsion type motors. (5)