

[This question paper contains 2 printed pages.]

Sr. No. of Question Paper : 1807

Your Roll No.....

Unique Paper Code : 2512012401

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Name of the Course : B.Sc.(H) Electronics (Core)

Name of the Paper : Electrical Technology

Semester : IV

Duration : 03 Hours

Maximum Marks : 90

Instruction for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any five questions in all, including, Question number 1, which is compulsory.
3. All questions carry equal marks.
4. Use of non-programmable scientific calculator is allowed.

1. (a) What are the advantages of polyphase system over single phase system?
3
(b) Name the parameters measured by the open circuit and short circuit test for transformer.
3
(c) State different kind of losses in a dc generator.
3
(d) A series motor should not be started without load. Justify.
3
(e) A three phase 11KV, 50Hz synchronous generator runs at 1500rpm. Determine the number of poles.
3
(f) What is Slip? What is its value at synchronous speed?
3
2. (a) Show that the total power in both delta and star three phase system for balanced load conditions is given by the same expression.
6
(b) With the help of phasor diagram, explain the operation of single phase transformer under full load condition.
6
(c) A 25-kVA transformer has 500 turns on the primary and 50 turns on the secondary winding. The primary is connected to 3000-V, 50-Hz supply. Find the full-load primary and secondary currents, the secondary e.m.f. and the maximum flux in the core. Neglect leakage drops and no-load primary current.
6
3. (a) Derive the voltage equation of a dc motor. What is the significance of back e.m.f in dc motor?
6
(b) A shunt generator delivers 195 A at terminal p.d. of 250 V. The armature resistance and shunt field resistance are $0.02\ \Omega$ and $50\ \Omega$ respectively. The iron and friction losses

- equal 950 W. Find (a) e.m.f. generated (b) Cu losses (c) output of the prime mover (d) commercial, mechanical and electrical efficiencies. 6
- (c) What are the various methods of controlling the speed of a dc shunt motor? Explain one method in detail. 6
4. (a) A 50-kVA, 4,400/220-V transformer has $R_1 = 3.45 \, \Omega$, $R_2 = 0.009 \, \Omega$. The values of reactances are $X_1 = 5.2 \, \Omega$ and $X_2 = 0.015 \, \Omega$. 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. 6
- (b) Give the characteristics of DC shunt motor. 6
- (c) A short-shunt compound generator delivers a load current of 30 A at 220 V, and has armature, series-field and shunt-field resistances of $0.05 \, \Omega$, $0.30 \, \Omega$ and $200 \, \Omega$ respectively. Calculate the generated e.m.f. and the armature current. Allow 1.0 V per brush for contact drop. 6
5. (a) Derive the expression for starting torque of three-phase induction motor. 6
- (b) Define regulation of a transformer. Derive the condition for maximum efficiency of a transformer. 6
- (c) Write a short note on universal motor. 6
6. (a) Obtain the relationship between torque and rotor power factor for a polyphase induction motor. Discuss the two cases (i) when the rotor is inductive and (ii) when the rotor is non-inductive. 6
- (b) 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 current when the slip is 0.03.
 (iv) the frequency of the rotor current at standstill. 6
- (c) How is a single phase induction motor made self-starting? 6
7. (a) Explain the principle of operation of synchronous motor. 6
- (b) Because of slow rotative speeds of engine-driven alternators, their number of poles is much greater as compared to that of the turbo-generators which run at very high speeds. Justify. 6
- (c) Compare between induction and synchronous motor 6