This question paper contains **3** printed pages]

Roll No. | | | | | | | | | | |

S. No. of Question Paper : **6478**

Unique Paper Code : **251601** **D**

Name of the Paper : **Electrical Machines [ELHT-601]**

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

Semester : **VI**

Duration : **3 Hours** Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *Five* questions in all including

Question No. **1** which is compulsory.

Use of non-programmable scientific calculator is allowed.

1. (*a*) Define pole pitch. 3

(*b*) What is the significance of critical resistance in a d.c. generator ? 3

(*c*) What is the necessity of a motor starter ? 3

(*d*) What do you understand by all day efficiency of a transformer ? 3

(*e*) Distinguish between operating principle of a.c. motor and d.c. motor. 3

2. (*a*) Give the classification of different types of d.c. generators. 5

(*b*) An 8-pole d.c. shunt generator with 778 wave connected armature conductors and running at 500 r.p.m. supplies a load of 12.5 ohms resistance at terminal voltage of 250 V. The armature resistance is 0.24 ohms and the field resistance is 250 ohms. Find the armature current, the induced e.m.f. and the flux per pole. 5

P.T.O.

(*c*) Give the external characteristics of d.c. shunt generator. 5

3. (*a*) A 440 V shunt motor has armature resistance of 0.8 ohms and field resistance of 200 ohms. Determine the back e.m.f. when giving an output of 7.46 kW at 85% efficiency. 5

(*b*) Give the characteristics of d.c. series motor. 5

(*c*) Explain the armature control method of speed control of d.c. shunt motor. 5

4. (*a*) Derive the relation between the phase and line voltages, phase and line currents in 3-phase star connected system. Draw the phasor diagram. 6

(*b*) Derive the expression for total power in 3-phase star connected system. 4

(*c*) What are the advantages of autotransformer ? 5

5. (*a*) A 30 kVA, 2400/120 V, 50 Hz transformer has a high voltage winding resistance of 0.1 ohm and a leakage reactance of 0.22 ohms. The low voltage winding resistance is 0.035 ohms and the leakage reactance is 0.012 ohms. Find the equivalent winding resistance, reactance and impedance referred to the high voltage side. 5

(*b*) Briefly explain the short circuit test of a transformer. 5

(*c*) Derive the condition for maximum efficiency of a transformer. 5

6. (*a*) A three-phase induction motor is wound for 4 poles and is supplied from 50 Hz system. Calculate :

(*i*) the synchronous speed

(*ii*) the rotor speed when slip is 4%

(*iii*) rotor frequency when rotor runs at 600 r.p.m. 4

(*b*) Explain why does the rotor rotate in a 3-phase induction motor. 5

(*c*) Derive an expression for starting torque of 3-phase induction motor. Derive the condition for maximum starting torque. 6

7. (*a*) List the characteristic features of a synchronous motor. 5

(*b*) Explain the working of split phase motor. 5

(*c*) Describe the working of Universal motor. 5