22629

23242

3 Hours / 70 Marks Seat No. | | | | | | | | |

Instructions : (1) All Questions are *compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answers with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

(6) Use of Non-programmable Electronic Pocket Calculator is permissible.

(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

(8) Preferably, write the answers in sequential order.

Marks

1. Attempt any FIVE of the following : **10**

(a) State the advantages of electric drive.

(b) Draw the speed-torque characteristics of DC series motor.

(c) Draw the circuit diagram of single phase half wave converter.

(d) Draw the waveforms for single phase fully controlled converter for firing angle ($\alpha < 90°$).

(e) List out speed control method of AC drives.

(f) State the specifications of stepper motor.

(g) State the advantages of microprocessor or microcontroller based drives.

2. Attempt any THREE of the following : **12**

(a) State the selection criteria for electric drive.

(b) Explain with neat sketches the operation of three phase full wave converter.

(c) Explain with sketches Class-A chopper drive.

(d) Explain with sketches variable frequency control method using square wave inverter.

3. Attempt any THREE of the following : **12**

(a) List the duty class of motor and describe intermittent duty class.

(b) Compare semi-converter drives and full converter drives (any **4** points).

(c) Draw and describe Class-E chopper drive.

(d) Describe the solar power pump drive.

4. Attempt any THREE of the following : **12**

(a) Draw and describe chopper controlled drive in solar and battery powered vehicles.

(b) Suggest drives required for following applications :

(i) Textile Mills

(ii) Steel Rolling Mills

(c) Explain rotor resistance control method using chopper for induction motor.

(d) Explain block diagram of phase locked loop control of DC motor.

(e) Explain with sketch of DC drives using microcontroller's control.

5. Attempt any TWO of the following : **12**

(a) Explain with circuit diagram of 3ϕ-Semi-converter using SCR with proper waveforms.

(b) Draw and describe Class-C chopper drive.

(c) Explain with the sketches closed loop control for synchronous motor.

6. Attempt any TWO of the following : **12**

(a) The speed of a 15 HP 220 V, 1500 rpm dc separately excited motor is controlled by a single phase full converter. The armature resistance being 0.5 Ω, the motor operates at a load of 25 A, the armature current being continuous.

If the AC supply voltage is 250 V, motor voltage constant = 0.2 V/rp, find, at a load of 25 A, firing angle 45°, (i) the speed of the motor (ii) torque of the motor and (iii) power to the motor.

(b) State the classification of chopper on the basis on output voltage and quadrant of operation. Explain basic chopper circuit using SCR with proper waveforms.

(c) Explain the slip power recovery system.
