

22629

23242

3 Hours / 70 Marks

Seat No.

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- 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 ($\alpha < 90^\circ$).
- (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 3 ϕ -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.
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