

22629

22232

3 Hours / 70 Marks

Seat No.

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- Instructions :**
- (1) All Questions are *compulsory*.
  - (2) Illustrate your answers with neat sketches wherever necessary.
  - (3) Figures to the right indicate full marks.
  - (4) Assume suitable data, if necessary.

**Marks**

1. Attempt any FIVE of the following :

10

- (a) State the types of electric drives.
- (b) Draw the basic block diagram of electric drive.
- (c) Draw a neat circuit diagram of single phase semi converter.
- (d) State the types of SCR controlled drives.
- (e) List out any four applications of electric drives.
- (f) Write any four specifications of stepper motor.
- (g) State any four advantages of microprocessor based drives.

2. Attempt any THREE of the following :

12

- (a) List out the selection criteria of electric drives.
- (b) Describe the operation of single phase full wave converter with a neat circuit diagram.
- (c) Draw a neat circuit diagram of class B chopper and give its operation with waveforms.
- (d) Explain stator voltage control method of 3 $\phi$  induction motor with a neat diagram.



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

- (a) List the duty class of motor and describe continuous duty class.
- (b) Compare semi-converter drives and full converter drives on the basis of
  - (i) Quadrant operation
  - (ii) Regenerative braking
  - (iii) Power flow
  - (iv) Harmonic contents
- (c) Draw a neat circuit diagram of basic chopper circuit using SCR and explain.
- (d) Describe the operation of rotor resistance control method of 3 $\phi$  induction motor with a neat diagram.

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

- (a) Describe the operation of class D chopper and explain with waveforms.
- (b) Compare DC and AC drives.
- (c) Describe the working of constant  $\left(\frac{v}{f}\right)$  control of 3 $\phi$  induction motor with a neat diagram.
- (d) Draw labelled block diagram of Phase Locked Loop (PLL) control of DC motor drive. State the function of each block.
- (e) Draw the block diagram of synchronous motor drive and state the function of each block.

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

- (a) A single phase full converter fed from 230 V, 50 Hz supply provides a variable voltage supply to the armature of a separately excited DC motor. The specification of motor are 10 HP, 230 V, 1200 rpm,  $R_a = 0.25 \Omega$ . Rated motor current is 40 A and motor voltage constant,  $K_a \phi = 0.182 \text{ V/rpm}$ . The firing angle is  $30^\circ$ . For the rated motor current, calculate ;
- (i) Motor torque
  - (ii) Speed of the motor
- (b) Draw and describe class E chopper drive.
- (c) Describe the operation of stepper motor drives employing microcontroller with a neat diagram.

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

- (a) Draw a circuit diagram of  $1\phi$  dual converter and describe its operation with quadrant diagram.
- (b) Explain with sketches the operation of chopper controlled dc drive in solar and battery operated vehicles.
- (c) State the stages involved in textile mills and types of drives used for it.
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