

22629

21222

3 Hours / 70 Marks

Seat No.

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15 minutes extra for each hour

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

Marks

1. Attempt any FIVE of the following :

10

- (a) State the need of electric drives.
- (b) Draw block diagram of the basic elements of electric drives.
- (c) List the advantages of converter controlled drives.
- (d) Draw the circuit diagram of single phase half wave controlled converter drive.
- (e) Draw the circuit diagram of rotor resistance control method of Induction motor.
- (f) State the advantages of microcontroller based system over electronic speed control systems.
- (g) State the functions of microprocessor in drives.

2. Attempt any THREE of the following :

12

- (a) Describe the four quadrant operation of a hoist with speed torque characteristics.
- (b) Compare single phase and three phase full converter drives (Any four points).
- (c) State the role of drives in sugar mills.
- (d) Draw labelled block diagram of Phase Lock Loop (PLL) control DC motor drive. State the function of each block.

3. Attempt any THREE of the following : 12

- (a) Draw speed torque characteristics of Induction motor showing all regions.
- (b) Draw the circuit diagram of single phase dual converter drive and explain its operation.
- (c) Compare Class A and Class B chopper drive (Any four points).
- (d) Describe the working of V/F control method for speed control of Induction motor with neat block diagram.

4. Attempt any THREE of the following : 12

- (a) Identify type of Chopper for forward motoring and forward braking of DC motor. Justify your answer with neat sketch.
- (b) State the sequence of stages involved in Textile mill and the types of drive used for it.
- (c) Describe with diagram the operation of centrifugal solar powered pump drives.
- (d) Draw and explain microprocessor based control of synchronous motor drives.
- (e) Draw the block diagram of microprocessor based control of DC motor.

5. Attempt any TWO of the following : 12

- (a) A separately excited dc motor is fed from 230 V, 50 Hz supply via a 1ϕ half controlled bridge rectifier. Armature parameters are $L = 0.06$ H, $R = 0.3 \Omega$, $K_a = 0.9$ V/A rad/s and $R_f = 104\Omega$. The field current is also controlled by a semiconverter and is set to a maximum possible value. $T_L = 50$ N-m at 800 rpm. The inductances of armatures and field circuits are sufficient enough to make the armature and field currents continuous and ripple free. Compute :
 - (i) Field current I_f ,
 - (ii) Firing angle of the converter in the armature circuit

- (b) Draw and describe four Quadrant Chopper Drive.
- (c) State the rating and specification of stepper motor. If there are 4 pairs of stator phases and 6 teeth on rotor, calculate step angle.

6. Attempt any TWO of the following :

12

- (a) Draw the circuit diagram and waveforms of 3ϕ semiconverter drive. State the equation of average armature voltage.
 - (b) Classify choppers based on quadrant of operation with neat diagram and waveform, explain the operation of basic chopper circuit using SCR.
 - (c) Compare between the stator voltage control, constant V/F control and rotor resistance control (Any four points).
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