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15162

3 Hours / 100 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.
(5) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. a) Attempt any THREE of the following: 12
- (i) What is the need of an electric drives and draw the block diagram of an electric drive.
 - (ii) List four advantages of microcontroller or microprocessor based control for drives.
 - (iii) Write four advantages of electronic motors as prime movers?
 - (iv) Draw and label half wave converter drive using separately excited motor.
- b) Attempt any ONE of the following: 6
- (i) Explain four quadrant operation of a drive with a neat diagram.
 - (ii) Explain with a neat circuit diagram, a 3 ϕ full wave converter drive using DC shunt motor and also explain the need of free wheeling diode.

P.T.O.

2. Attempt any FOUR of the following:**16**

- a) Draw and explain DC chopper using power MOSFET.
- b) List eight industrial applications of drives.
- c) Compare semi converter drive and full converter drives on the basis of:
 - (i) Quadrant operation
 - (ii) Power flow
 - (iii) Regenerative braking
 - (iv) Motor heating.
- d) Write four advantages of converter fed IM.
- e) A 3 ϕ IM is wound for 4 poles and is supplied from 60Hz system. Calculate synchronous speed.
- f) What are various electric braking methods of D.C. motor and explain any one of them.

3. Attempt any FOUR of the following:**16**

- a) Write the working principle of DC motor and draw the characteristics of DC shunt motor (Torque - speed)
- b) Classify chopper drives with respect to:
 - (i) Input/output voltage
 - (ii) Output voltage - current direction
- c) Draw neatly single phase dual converter drive and explain in brief.
- d) Draw the suitable circuit diagram of chopper for forward motoring and forward braking and explain the working.
- e) Compare AC drives and DC drives on the basis of:
 - (i) Type of motor
 - (ii) Speed of operation
 - (iii) Power circuit used
 - (iv) Application.
- f) List any four functions performed by microprocessor in speed control of industrial drives.

4. a) Attempt any THREE of the following: 12
- (i) Draw and label the phase failure protection circuit using in three phase drive.
 - (ii) List various methods of control the speed of AC drives.
 - (iii) Draw and explain the working PLL based dc drive.
 - (iv) Write four important ratings and four specifications of stepper motor.
- b) Attempt any ONE of the following: 6
- (i) Write the sequence of stages and drivers required in each stage for sugar mills.
 - (ii) Write eight important factors to select a drive.
5. Attempt any FOUR of the following: 16
- a) A three phase half controlled bridge rectifier fed from 230 V, 50Hz supply provides a variable voltage supply to the armature of a separately excited DC motor. The specification of motor an $R = 0.2\Omega$, $L = 0.002$ henry; Constant of motor = 2.25V/rad; Rated current 500 Amp. Determine the firing angle α so that the motor runs at 1500 rpm speed.
 - b) Write the equation between speed, frequency and no. of poles of IM and also define slip of the induction motor.
 - c) Draw labeled block diagram of PWM control method of induction motor. Write any two advantages of it.
 - d) Explain the drives that are used in machine tools
 - e) List advantages of induction motor drive over DC motor drive.
 - f) Draw a block diagram of microprocessor based DC motor controller.

6. Attempt any FOUR of the following:**16**

- a) Which type of drive motor is suitable for elevator control. Explain the same.
 - b) Write the procedure to achieve soft start of induction motor using thyristor circuit? Justify the answer.
 - c) Draw neatly the block diagram and working of motor resistance control using chopper.
 - d) Explain various speed drives that are used in paper mills at every stage of operation.
 - e) Write the principle of operation of low speed AC motor with cyclo converter. Draw its output wave form for single phase and write two application of cyclo converter drive.
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