

17667

21415

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) Use of Non-programmable Electronic Pocket Calculator is permissible.
(6) 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) State the advantages of electric motor as prime mover.
 - (ii) Describe the working of single phase semi converter drive feeding a separately excited DC motor. Draw voltage and current waveforms.
 - (iii) State the factors that should be considered for drive selection.
 - (iv) Draw a neat diagram and explain the working of phase locked loop control of DC motor.
- b) Attempt any ONE of the following: 6
- (i) Compare single phase and three phase full converter drive (any six points).
 - (ii) Describe the four types of braking methods for induction motor.

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- 2. Attempt any FOUR of the following:** **16**
- a) List various stages involved in textile mill and its speed ratings at each state.
 - b) Describe four quadrant operation of hoist.
 - c) Give the detailed classification of chopper controlled drives.
 - d) Describe the working of PWM control of induction motor.
 - e) Sketch quadrant diagram for four quadrant chopper drive and write action of drive in each quadrant.
 - f) State the advantages of converter fed induction motor.
- 3. Attempt any FOUR of the following:** **16**
- a) Compare AC drives and DC drives (any four points).
 - b) State suitable type of chopper for very large load-current requirement, justify with neat sketch.
 - c) State suitable type of chopper for forward motoring and forward braking. Draw its quadrant of operation.
 - d) Describe the operation of DC chopper using power MOSFET. Also draw voltage and current waveforms.
 - e) With a neat circuit, explain the working of 3 ϕ full converter drive. State the equation of average armature voltage.
- 4. a) Attempt any THREE of the following:** **12**
- (i) Describe field failure protection in three phase drives.
 - (ii) Draw Torque vs Speed/Slip characteristics of induction motor showing all regions. Explain it.
 - (iii) State the advantages of microcontroller based control for drives.
 - (iv) State eight functions of microprocessor in drives.

b) Attempt any ONE of the following:

6

- (i) Which type of drive/motor is used in paper mill at each stage? State specifications of drive at each stage.
- (ii) Illustrate drives stability with the help of Torque-speed characteristics.

5. Attempt any FOUR of the following:

16

- a) Describe chopper controlled induction motor drive employing rotor resistance control technique.
- b) A single phase full converter fed from 230 volt, 50 Hz supply provides a variable voltage supply to the armature of a separately excited DC motor. The specifications of motor are 10 HP, 230 Volt, 1200 rpm, $R_a = 0.25 \Omega$. Rated motor current is 40 amp, motor voltage constant $K_a \phi = 0.182 \text{ V/rpm}$. The motor current is continuous and ripple free. The firing angle is 30° . For the rated motor current. Calculate:
 - (i) Motor Torque
 - (ii) Speed of the motor.
- c) A 4-pole 1580 rpm, 3 ϕ Im is operated from a per phase voltage of 230 V/60 Hz and driving a constant torque load. Calculate the following at $f = 30 \text{ Hz}$, $\phi_{ag} = 5.2$
 - (i) Supply voltage/phase
 - (ii) Slip
 - (iii) Slip frequency
 - (iv) Slip at 30 Hz
- d) Describe the role of drives in sugar mill.
- e) Draw the power circuit for single phase full converter drive of dc series motor. Also draw voltage and current waveforms for continuous motor current.
- f) Draw the block diagram to drive separately excited dc motor using microprocessor.

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

- a) Draw and explain the block diagram of synchronous motor drive using microcontroller.
 - b) Which type of drive motor is suitable for Robotic Arm? Explain its working with block diagram using microprocessor.
 - c) Compare stator voltage control and constant v/f control methods of speed control of induction motor.
 - d) Suggest suitable type of drive for machine tool applications and justify your answer.
 - e) With the help of block diagram explain v/f control using square wave inverter.
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