

# 17667

**15116**

**3 Hours / 100 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.

**Marks**

1. a) Attempt any THREE of the following: **12**
  - (i) State four advantages of electric motor as prime mover.
  - (ii) List different factors considered for selection of electric drives.
  - (iii) Draw block diagram of microcomputer based speed control of synchronous motor.
  - (iv) Draw circuit diagram of single phase full controlled bridge converter alongwith waveforms.
  
- b) Attempt any ONE of the following: **6**
  - (i) Describe four quadrant operation of a drive with the help of speed-torque characteristics.
  - (ii) With the help of neat diagram explain operation of three phase semi-converter.

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- 2. Attempt any FOUR of the following:** **16**
- a) State four braking methods of an electric drive.
  - b) List different requirements of motors used for machine-tool applications.
  - c) Describe working of two quadrant chopper drive with the help of ckt. digram and waveforms.
  - d) List any four advantages of converter fed induction motor.
  - e) Draw labelled block diagram of PWM controlled method of induction motor. List any two advantages.
  - f) What is the need of multi-phase chopper? Explain its working with circuit diagram and wave-forms.
- 3. Attempt any FOUR of the following:** **16**
- a) Identify suitable type of chopper drive for reversible regenerative braking of DC drive. Justify with neat sketches.
  - b) With the help of circuit diagram and waveforms, explain the working of DC chopper using Power MOSFET.
  - c) Draw power circuit for 3 phase dual converter with neat labelled diagram. Give its application.
  - d) Compare DC shunt and DC series motor with reference to its construction, characteristics and applications.
  - e) Compare AC drives and DC drives based on:
    - (i) Working principle
    - (ii) Type of motor
    - (iii) Power circuit used
    - (iv) Applications

- 4 a) Attempt any THREE of the following:** **12**
- (i) State importance of phase failure protection in 3 phase drives.
  - (ii) Describe the effect of increasing rotor resistance in an induction motor with the help of speed-torque characteristics.
  - (iii) Describe the role of microprocessor for speed control of DC motor with neat block diagram.
  - (iv) List any four functions performed by microprocessor in speed control of industrial drives.
- b) Attempt any ONE of the following:** **6**
- (i) Draw block diagram of basic elements of a drive. Explain each block in detail.
  - (ii) Which type of drive/motor is used in steel-rolling mill at each stage? State specifications of drive at each stage.
- 5. Attempt any FOUR of the following:** **16**
- a) Compare single phase and three phase drives (any four points).
  - b) A four pole three phase induction motor operates from a 240 V supply at 50 Hz. Calculate:
    - (i) Speed of rotating magnetic flux
    - (ii) Speed of rotor if slip is 0.04
    - (iii) Speed of rotor if slip is 0.03
    - (iv) Frequency of rotor at standstill
  - c) Describe the working of voltage/frequency control using square-wave inverter.
  - d) List different requirements of motor used for paper-mill application.
  - e) Draw the circuit diagram and waveforms for single phase semi-converter with symmetrical and assymetrical configurations.
  - f) With the help of block schematic explain the use of phase locked loop (PLL) for speed control of DC motors.

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

- a) List four ratings and four specifications of stepper motor.
  - b) Which type of drive motor is suitable for Robotic arm?  
Explain its working with diagram.
  - c) List the different methods of speed control of induction motor.  
Explain any one in detail.
  - d) Write different stages and drives required for sugar mills.
  - e) Draw a block diagram of closed loop control of a synchronous motor.
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