22629

12223

3 Hours / 70 Marks Seat No. | | | | | | | | |

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. Attempt any FIVE of the following : **10**

(a) Draw the block diagram of Electric Drive.
(b) Classify the meters according to duty class.
(c) Draw the circuit of single phase half-wave SCR converter drive.
(d) Give the classification of 3ϕ SCR drives.
(e) State the need for speed control of AC drives.
(f) List four specifications of stepper motor.
(g) List two functions of microprocessor in drives.

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

(a) Sketch speed-torque characteristics of three phase induction motor and explain regions of operation.

(b) Compare 1ϕ semi-converter drive and 1ϕ full converter drive on the basis of
  (i) No. of SCRs
  (ii) Harmonics
  (iii) Quadrant operation
  (iv) Regenerative braking

(c) Draw and explain the block diagram of class B chopper drive.

(d) Draw and explain the block diagrams of stator voltage control method using thyristor circuit.

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

(a) Draw and explain speed torque characteristics of DC shunt and DC series motors.

(b) Draw the circuit of 3ϕ semi-converter drive and state the equation of average armature voltage.

(c) Explain the working of class A chopper drive with a neat circuit diagram.

(d) List the stages in sugar mills and state the types of motor used at each stage.

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

(a) Explain the working of Class C chopper drive with a neat circuit diagram.

(b) Explain steel rolling mills and the drives used at each stage.

(c) Draw the block diagram of V/f control method and explain the working.

(d) List four advantages of microprocessor based control for drives.

(e) Draw and explain the block diagram of Phase Locked Loop (PLL) control of DC motor.

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

(a) Explain the working of 1ϕ dual converter drive with a neat sketch and waveforms.

(b) Explain the application of chopper control in solar and battery powered vehicles.

(c) Draw the block diagram of microprocessor based control of DC motor and explain it.

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

(a) A full converter drive operated from single phase 230 V, 50 Hz supply drives a 9 H.P. 200 V, 1500 rpm, separately existed DC motor. The rated armature current is 50 A. Motor parameters Ra = 0.3 Ω, La = 10 mH, Ka ϕ constant = 0.2 V/m. Find the (i) average armature voltage (ii) back emf of motor (iii) speed of motor (iv) motor torque of a firing angle of 30°.

(b) Explain Class E chopper drive.

(c) Explain rotor resistance control using chopper with a neat circuit diagram.