16172

3 Hours / 100 Marks Seat No.

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.

(8) Use of steam tables, logarithmic, Mollier's chart is permitted.

Marks

1. **(A)** **Attempt any THREE :** **12**

(a) Draw and explain the block diagram of electric drive.

(b) State the need of electric drives.

(c) State eight functions of microprocessor in drive technology.

(d) Draw and explain the operation of single phase semi-converter drive with waveforms.

(B) **Attempt any ONE :** **6**

(a) Explain the 4 quadrant operation of a drive.

(b) Compare semiconverter drives and full converter drives on the basis of

(i) Quadrant of operation

(ii) Regenerative braking

(iii) Power flow

(iv) Harmonic contents

(v) Peak motor current

(vi) Motor heating

2.   **Attempt any FOUR :**   16

   (a)   State the factors to be considered for the selection of a drive.

   (b)   State the requirements and the type of drives used in sugar mills.

   (c)   Draw and explain a dc chopper using MOSFET.

   (d)   State four advantages of converter fed induction motors.

   (e)   Draw the block diagram and explain V/f control using square wave inverter.

   (f)   Draw and explain a 2 quadrant chopper drive.

3.   **Attempt any FOUR :**   16

   (a)   State the types of electric braking and state 2 advantages of electric braking.

   (b)   State the stages involved in textile mills and the type of drives used for it.

   (c)   Draw the circuit for three phase dual converter.

   (d)   Draw and explain the operation of a chopper circuit used for reversible drive.

   (e)   Draw and explain the operation of multiphase chopper drive.

4.   **(A)   Attempt any THREE :**   12

   (a)   Draw the circuit of a three phase semiconverter drive. State the equation of average armature voltage.

   (b)   State the methods of speed control of Induction Motor.

   (c)   Draw and explain PLL control of dc motor.

   (d)   Draw and explain stepper motor control using microcontroller.

(B) **Attempt any ONE :** 6

    (a) State the different stages in paper mill and the type of drive used for it.

    (b) State different stages in steel rolling mills and the type of drive used for it.

5. **Attempt any FOUR :** 16

    (a) A 4 pole, 1440 rpm 3ϕ I/M is operated from per phase voltage of 240 V, 50 Hz and driving a constant torque load. Calculate the following at frequency of 25 Hz, ϕ_{ag} = 4.8 : (i) supply voltage/phase, (ii) slip, (iii) slip frequency, (iv) slip at 25 Hz.

    (b) A semiconverter operated from 1ϕ 230 V, 50 Hz supply drives a 10 H.P, 200 V, 1500 rpm separately excited dc motor. Rated armature current is 40 A, motor parameter are R_a = 0.5 Ω, L_a = 10 mH, K_a $\phi_{constant}$ = 0.2 V/rpm. Find the following for $\alpha = 30°$

        (i) average armature voltage

        (ii) speed of the motor

    (c) Draw the block diagram and explain the working of PWM control of I/M.

    (d) List different requirements of motors used for machine tools.

    (e) State the types of SCR controlled drives. State 4 advantages of converter controlled drives.

    (f) Draw and explain microprocessor based control of synchronous motor.

6.   **Attempt any FOUR :**   16

(a)   Draw the block diagram of microprocessor based control of dc motor.

(b)   State eight advantages of microprocessor based control of drives.

(c)   Draw the block diagram and explain the working of motor resistance control using chopper.

(d)   Draw the characteristics of dc shunt and series motor.

(e)   Draw the block diagram and working of closed loop control of synchronous motor.

_____