

Total No. of Questions : 6]

SEAT No. :

P33

[Total No. of Pages : 2

APR.-17/B.E./Insem. - 37

B.E. (Electrical Engg.)

POWER ELECTRONICS CONTROLLED DRIVES

(2012 Pattern) (Semester - II)

Time :1 Hour]

[Max. Marks : 30

Instructions to the candidates:

- 1) *Answer Q No.1 or 2, Q No.3 or 4, Q No.5 or 6.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of calculator is allowed.*

- Q1) a)** A motor is used to drive the hoist. The motor has following characteristics:
Quadrants I, II and IV; $T = 200 - 0.2N$, N-m
Quadrants II, III and IV; $T = -200 - 0.2N$, N-m
where N is the speed in rpm. When it is loaded, the net load torque is $T_l = 100$ N-m and when it is unloaded, net load torque $T_l = -80$ N-m.
Calculate motor speeds for motoring and braking operations in all the four quadrants. **[4]**
- b) What are different torque components? Explain with their characteristics. **[6]**

OR

- Q2) a)** With a neat block diagram, explain the components of Electric drive. **[6]**
- b) A drive has following equations for motor and load torques: **[4]**
 $T = (15 + 0.5\omega_m)$ and $T_l = 5 + 0.6\omega_m$
Obtain the equilibrium points and comment on their steady state stability.

- Q3) a)** Compare Regenerative braking and Dynamic braking of DC separately excited motor. **[4]**
- b) A 200 V, 875 rpm, 150A separately excited dc motor is fed from a single phase fully controlled rectifier with an AC source voltage of 220 V, 50 Hz, $R_a = 0.06 \Omega$. For continuous conduction, calculate the firing angles for rated motor torque and 750 rpm. **[6]**

OR

P.T.O.

- Q4)** a) A 220 V, 970 rpm, 100 A dc separately excited motor has an armature resistance of 0.05Ω . It is braked by plugging from an initial speed of 1000 rpm. Calculate the resistance to be placed in armature circuit to limit braking current to twice the full load value. [6]
- b) Explain the motoring operation of chopper fed DC separately excited motor along with the speed torque characteristics. [4]

- Q5)** a) Explain the regenerative braking of 3 ph induction motor. [5]
- b) A star connected squirrel cage induction motor has following ratings and parameters: 400V, 50Hz, 4 pole 1370 rpm, $R_s = 2 \Omega$, $R_r' = 3 \Omega$, $X_s = X_r' = 3.5 \Omega$. Motor is controlled by VSI at constant v/f ratio. For regenerative braking of this motor, calculate Speed for a frequency of 30 Hz and 80% of full load torque. Assume motor speed torque characteristics from full load motoring to full load braking to be parallel straight lines, [5]

OR

- Q6)** a) A 400 V star connected 3 phase, 6 pole, 50 Hz, induction motor has following parameters referred to the stator. $R_s = R_r' = 1 \Omega$, $X_s = X_r' = 2 \Omega$. The motor is braked by plugging from its initial speed of 950 rpm. Calculate the initial braking current and torque as a ratio of their full load values. [6]
- b) Explain the thyristorised stator voltage control of 3 ph induction motor. [4]

