Total No. of Questions : 6]

P33

SEAT No. :

[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 - 0.2 N, N-m

Quadrants II, III and IV; T= -200-0.2 N, 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]**

$$T = (15 + 0.5\omega_m) \text{ and } T_l = 5 + 0.6\omega_m$$

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 Ω. 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 0.05 Ω. 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, Rs = 2 Ω, R_r'= 3 Ω, $X_s = X_r'$=3.5Ω. 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. $Rs = R_r'$=1Ω, $X_s = X_r'$= 2Ω. 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]**

▽▽▽▽