

Total No. of Questions :6]

SEAT No. :

**P105**

**BE/Insem./APR-146**

[Total No. of Pages : 2

**B.E. (Electrical)**

**403148 : POWER ELECTRONICS CONTROLLED DRIVES**

**(2012 Pattern) (Semester - II)**

*Time : 1 Hour]*

*[Max. Marks : 30*

*Instructions to the candidates:*

- 1) Answer Q1 or 2, Q3 or 4, Q5 or 6.
- 2) Figures to the right indicate full marks.

**Q1) a)** A motor is used to drive the hoist. The motor has following characteristics. **[4]**

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.

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,  $R_a = 0.06 \Omega$ . 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  $0.05 \Omega$ . 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, 50 Hz, 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]

