

Total No. of Questions : 6]

P105

BE/Insem./APR-146

B.E. (Electrical)

403148 : POWER ELECTRONICS CONTROLLED DRIVES

(2012 Pattern) (Semester - II)

Time : 1 Hour]

Instructions to the candidates:

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

[Max. Marks : 30

Q1) a) A motor is used to drive the hoist. The motor has the 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, $R_s = 0.06 \Omega$. For continuous conduction, calculate the firing angles for rated motor torque and 750 rpm. **[6]**

OR

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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, 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]**

