

Total No. of Questions : 10]

SEAT No. :

P3145

[Total No. of Pages : 3

[5354]-633

B.E. (Electrical)

POWER ELECTRONICS CONTROLLED DRIVES

(2012 Pattern) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Neat diagrams must be drawn wherever necessary.
- 2) Figures to the right side indicate full marks.
- 3) Use of calculator is allowed.
- 4) Assume suitable data if necessary.

Q1) a) State essential parts of electrical drive and describe the function of each component in brief. [5]

b) A drive has following equations for motor and load torques : [5]

$T = (15 + 0.5\omega_m)$ and $T_l = 5 + 0.6\omega_m$ Obtain the steady state speed and comment on steady state stability using the condition for stability.

OR

Q2) a) A 220 V, 1500 rpm, 10 A separately excited dc motor is fed from a single phase fully controlled rectifier with an AC source voltage of 230 V, 50 Hz. $R_a = 2\Omega$. Assuming continuous conduction at firing angle of 35° and for rated motor torque operation find the speed in rpm. [5]

b) Explain load equalization in an Electric drive. How is it achieved? [5]

Q3) 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) With a neat diagram explain the regenerative braking mode of DC separately excited motor using class B chopper. [4]

OR

P.T.O.

- Q4)** a) A star connected squirrel cage induction motor has following ratings and parameters : [5]
400V, 50Hz, 4 pole 1370 rpm, $R_s = 2\Omega$, $R_r' = 3\Omega$, $X_s = X_r' = 3.5\Omega$
For regenerative braking Assuming motor speed torque characteristics from full load motoring to full load braking to be parallel straight lines, calculate Speed for a frequency of 30 Hz and 80% of full load torque.
- b) Explain the thyristorised stator voltage control of 3 ph induction motor. What are its demerits? [5]

- Q5)** a) Explain the Principle of vector control. How Induction Motor is converted to Characteristics of DC Motor? [10]
- b) Compare and comment on relative merits and demerits of VSI and CSI for induction motor drives. [6]

OR

- Q6)** a) How speed control is achieved using Vector control of induction motor? Draw vector diagram and explain. [10]
- b) Write in brief about control and applications of AC Servo Drives. [6]

- Q7)** a) What are the topologies used for PM BLDC Half Wave drives? Explain any one. [8]
- b) Explain unity power factor control of Permanent Magnet Brushless DC Motor. [8]

OR

- Q8)** a) How constant torque angle control is used for Permanent Magnet Brushless DC Motor? [8]
- b) Comment on use of Sensorless control of PM BLDC drives. [8]

Solve any Three

- Q9)** a) What special considerations are needed for inverter duty motors? [6]
- b) What motors are suitable for Sugar mill drive applications? [6]
- c) How motor duty and heating and cooling cycle affects the temperature of motor? [6]
- d) What are the requirements of drive in sugar mills? Explain duty cycle of sugar centrifuge. [6]

OR

Q10) Explain the Type of drives used for specific operations in case of following applications. Also specify the type of control achieved (Speed / torque) and advantages of using special drives. (Any Two) **[18]**

- a) Textile mills
- b) Centrifuged Pump
- c) Traction drives
- d) Electric and Hybrid Vehicle

