

Total No. of Questions : 10]

SEAT No. :

P1998

[Total No. of Pages : 3

[5059]-593

B.E. (Electrical)

POWER ELECTRONIC CONTROLLED DRIVES

(2012 Pattern) (Semester - II)

Time : 2.30 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) What are the main factors which decide the choice of electrical drive for a given application? **[6]**

b) A drive has the following parameters: **[4]**

$T = 150 - 0.1 N$, N-m, where N is the speed in rpm.

Load torque $T_L = 100$, N-m

Initially the drive is operating in steady-state.

The characteristics of the load torque are changed to $T_L = - 100$ N-m.

Calculate initial and final equilibrium speeds

OR

Q2) a) Explain the working of a single phase Fully controlled rectifier fed separately excited dc motor with armature voltage control, with neat circuit diagram. In which quadrants the motor can be operated assuming rated flux? **[6]**

b) Draw speed torque characteristics and explain Regenerative braking in Induction motor. **[4]**

Q3) A 220V, 20 kW dc shunt motor running at rated speed of 1200 rpm is braked using rheostatic braking. The armature resistance is 0.1ohm and motor efficiency 88 %. Calculate resistance required to be added in armature circuit to limit braking current to twice the rated value. Also calculate initial braking torque. **[10]**

P.T.O.

OR

- Q4)** a) A star connected squirrel cage induction motor has following ratings and parameters: 400V, 50 Hz, 4 pole 1370 rpm, $R_s = 2 \Omega$, $R_r = 3 \Omega$, $X_s = X_r = 3.5 \Omega$ 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. [5]
- b) With a neat diagram, explain V/f control of 3 phase induction motor. What is the range of speed control? [5]

- Q5)** a) How speed control is achieved using Vector control of induction motor? Draw vector diagram and explain. [10]
- b) Compare and comment on relative merits and demerits of VSI and CSI for induction motor drives. [6]

OR

- Q6)** a) Explain the Principle of vector control. [8]
- b) Write in brief about topology, control and applications of AC Servo Drives. [8]
- Q7)** a) Draw neat diagram to explain vector control of PM Synchronous Motor (PMSM). [8]
- b) Explain variable DC link converter topology for PM BLDC Half wave drives for motoring and Regenerative operating modes. [8]

OR

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

Q9) Solve any Three

- a) What is the selection criterion for motors? How rating of a motor subjected to variable load duty is decided? [6]
- b) What are the requirements of drive for rolling mill operations? [6]
- c) Why controlled torque starting is necessary in Textile machinery drives? How is it achieved? [6]
- d) What are the requirements of drive in sugar mills? Explain duty cycle of sugar centrifuge. [6]

OR

Q10) Solve any Three

- a) What are various motor duty patterns ? how are motors classified based on duty? [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) Why 4 quadrant operation of drive is needed for rolling mill drive? [6]

