

Total No. of Questions :10]

SEAT No. :

P3985

[4959]-1073

[Total No. of Pages :3

B.E. (Electrical)

POWER ELECTRONICS CONTROLLED DRIVES

(2012 Course) (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) Explain in brief the following methods of braking of DC motor [6]

- i) Regenerative braking
- ii) Plugging

b) A motor-load has following details: Quadrants I and II, $T = 400 - 0.4N$, N-m where N is the speed in rpm. Motor is coupled to an active load torque ± 200 N-m. When operating in quadrant III and IV, $T = -400 - 0.4N$ N-m. Calculate motor speeds in I, II, III and IV quadrants. [4]

OR

Q2) a) A star connected squirrel cage induction motor fed from inverter has following rating and parameters. 400V, 50 Hz, 4 pole, 1370 rpm, $R_s = 2\Omega$, $R_r' = 3\Omega$, $X_s = X_r' = 3.5\Omega$. Calculate: [6]

- i) Speed for a frequency of 30Hz and 80% of full load torque.
- ii) Frequency for a speed of 1000 rpm, and full load torque.

b) Derive the equivalent moment of inertia and torque for a motor driving rotational load. [4]

P.T.O.

- 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 900 rpm. Calculate the resistance to be placed in armature circuit to limit braking current to twice the full load value. [6]
- b) Explain the concept of steady state stability of a drive and write condition for steady state stability of motor load combination. [4]

OR

- Q4)** a) A 440V, 50 Hz, 6 pole star connected squirrel cage induction motor has following parameters referred to stator side: $R_s = 0.5\Omega$, $R_r' = 0.6\Omega$, $X_s = X_r' = 1\Omega$. Stator to rotor turns ratio is 2. For regenerative braking, calculate maximum overhauling torque it can hold? [6]
- b) Explain the thyristorised stator voltage control of 3 ph induction motor. What are its demerits? [4]
- Q5)** a) With a neat block diagram, explain the Flux oriented control of Induction 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) Draw neat diagram to explain Permanent Magnet Brushless DC Motor. [8]
- b) Explain unity power factor control of Permeanent 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]

Q9) Solve any Three:

- a) What special considerations are needed for inverter duty motors? [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) 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) Solar pumps
- b) Centrifuged Pump
- c) Traction drives
- d) Electric and Hybrid Vehicle

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