[4959]-1073

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 $\pm$ 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, Rs =2Ω, Rr' = 3Ω, Xs = Xr' = 3.5Ω. 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: Rs = 0.5Ω, Rr' = 0.6Ω, Xs = Xr' = 1Ω. 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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