[5670]-588

B.E. (Electrical)

POWER ELECTRONICS CONTROLLED DRIVES

(2015 Course) (Semester - II) (End Sem.) (403148)

Time : 2½ Hours]   *[Max. Marks : 70*

Instructions to the candidates:

1) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
2) *Neat diagrams must be drawn whenever necessary.*
3) *Figures to the right indicates full marks.*
4) *Use of Calculator is allowed.*
5) *Assume suitable data if necessary.*

Q1) a)   A drive has following parameters : J = 1kg -m2, T = 15-0.01 N, N-m and passive load torque, T_L = 0.005N, N-m, where N is the speed in rpm. Initially the drive is operating in steady-state. Now it is to be reversed. For this, motor characteristic is altered such that T = –15-0.01N. N-m for positive as well as negative values of N. Calculate the reversal Time. **[5]**

b)   Explain multi quadrant operation of a motor driving a hoist load   **[5]**

OR

Q2) a)   A 200V, 875rpm, 100A separately excited dc motor has an armature resistance of 0.06Ω. It is fed from a single phase full converter with an ac source voltage of 220V, 50Hz. Assuming continuous conduction, calculate firing angle for rated motor torque and 750 rpm.   **[5]**

b)   Explain Plugging of DC motor along with speed torque characteristics

[5]

Q3) a)   Write the merits and demerits of VSI and CSI fed Induction motor Drives   **[5]**

b)   A 3-phase, 400V, 50Hz, 6 pole, 925 rpm star connected induction motor has the following parameters: Rs = 0.2Ω, R'r = 0.3Ω, Xs = 0.5Ω. X'r = 1Ω. The motor is fed from a VSI with a constant V/f ratio. The motor is to be braked by plugging from its initial full load speed of 925 rpm. The stator to rotor turns ratio is 2. Calculate the initial braking torque.

[5]

OR

P.T.O.

Q4) a) A 220V, 1000 rpm dc series motor takes an armature current of 100A when driving a load with constant torque. Armature and Field resistance are 0.05Ω each. Now it is operated under dynamic braking at twice the rated torque and 800 rpm. Calculate the value of braking current and resistor. Assume linear magnetic circuit **[5]**

b) Explain the operation of a Chopper controlled Separately excited DC motor drive with suitable waveforms. Draw speed torque characteristics. **[5]**

Q5) a) Explain the Servo mechanism in servo drives with a neat diagram. **[6]**

b) Explain the principle of Vector control of three phase Induction motors with a neat diagram **[10]**

OR

Q6) a) Write a short note on selection criteria of motor. Why a motor of smaller rating can be selected for a short time duty? **[10]**

b) A constant speed drive has the following duty cycle. **[6]**
   i) Load rising linearly from 200 to 500 KW : 4 min
   ii) Uniform load of 400KW: 2 min
   iii) Regenerative power returned to the supply reducing linearly from 400KW to 0:3 min
   iv) Remains idle: 4 min

   Determine the power rating of the motor assuming loss to be proportional to (power)²

Q7) a) Draw and explain the block diagram of a self controlled synchronous motor fed from a three phase VSI **[10]**

b) What are the similarities between a brushless dc motor and a conventional dc motor? **[6]**

OR

Q8) a) What is a self control mode of synchronous motor? **[6]**

b) Explain the operation of three phase brushless dc motor drive along with related waveforms. **[10]**

Q9) Write a short notes on any three of the following **[18]**
   a) Crane and hoist drives
   b) Traction drives
   c) Sugar mills
   d) Textile mills

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