[5154]-643

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) What are different load torque components? Explain with their characteristics. **[5]**

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

$T = (15 + 0.5\omega_m)$ and $T_1 = 5 + 0.6\omega_m$ Obtain the equilibrium points and comment on their steady state 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. Ra=2Ω. Assuming continuous conduction calculate firing angle for rated motor torque and (1000) rpm. **[4]**

b) Explain following braking methods along with their torque speed characteristics of DC separately excited motors. **[6]**

i) Regenerative Braking

ii) Dynamic braking.

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 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

Q4) a)   A star connected squirrel cage induction motor has following ratings and parameters:400 V, 50 Hz, 4 pole 1370 rpm Rs = 2Ω, Rr' = 3Ω,

Xs = Xr' = 3.5Ω.   **[5]**

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)   Draw neat diagram to explain Permanent Magnet Brushless DC Motor.**[8]**

b)   Explain unity power factor control of Permanent Magnet Brushless DC

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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) Solve any Three:

a) What are various motor duty patterns? How are motors classified based on duty? **[6]**

b) Which motors are used widely for machine tool drives? Why? **[6]**

c) How motor duty and heating and cooling cycle affects the temperature of motor? Explain. **[6]**

d) Why 4 quadrant operation of drive is needed for rolling mill drive? **[6]**

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