PVP 14

Code: EE6T4

III B.Tech - II Semester – Regular/Supplementary Examinations March 2018

POWER SEMICONDUCTOR DRIVES
(ELECTRICAL & ELECTRONICS ENGINEERING)

Duration: 3 hours Max. Marks: 70

PART – A

Answer *all* the questions. All questions carry equal marks

11x 2 = 22 M

1.

a) Explain what do you understand by the steady – state stability?
b) What are the advantages of regenerative braking over other methods of braking?
c) What is the purpose of a free wheeling diode in converter fed to DC motors?
d) Explain different operating regions of torque speed curve of a 3 phase induction motor.
e) What are the causes for the harmonics & ripple in dc motor current?
f) Draw the block diagram for closed loop control of DC motor.
g) Discuss the role of Cyclo converters for speed control of Induction motor.
h) Explain various modes of operation of static Kramer drive.
i) What do you understand by the term linear Transformation as used in electrical machines?
j) Summarize the important features of DTC control?
k) What is meant by multi quadrant operation?

PART – B

Answer any *THREE* questions. All questions carry equal marks.

3 x 16 = 48 M

2. a) Draw the block diagram of an electric drive and discuss briefly the function of various parts of electric drive. 8 M

   b) How do you define passive and active load torques in detail? What are the differences between those two torques? 8 M

3. The speed of a 150 HP, 650 V, 1750 rpm, separately excited d.c. motor is controlled by a 3-Φ, full converter. The converter is operating from a 3-Φ, 460 V, 50 Hz supply. The rated armature current of the motor is 170 A. The motor parameters are Ra = 0.099Ω, La = 0.73 mH, and KaΦ = 0.33 V/rpm. Neglecting losses in converter system, determine: 16 M

   i) No-load speeds at firing angles $\alpha = 0^0$ and $\alpha = 30^0$. Assume that at no-load, the armature current is 10% of the rated current and is continuous

   ii) The firing angle to obtain rated speed of 1750 rpm at rated motor current. Also, compute the supply power factor.

   iii)The speed regulation for the firing angle obtain in (ii)

4. a) A 220 V, 24 A, 1000 rpm separately excited dc motor having an armature resistance of 2 Ω is controlled by a chopper. The chopping frequency is 500 Hz and the input voltage is 230 V. Calculate the duty ratio for a motor torque of 1.2 times rated torque at 500 rpm. 8 M

b) A 230 V separately excited dc motor takes 50 A at a speed of 800 rpm. It has armature resistance of 0.4 Ω. This motor is controlled by a chopper with an input voltage of 230V and frequency of 500 Hz. Assuming continuous conditions throughout, Calculate and plot speed-torque characteristics for:

i) Motoring operation at duty ratios of 0.3 and 0.6

ii) Regenerative braking operation at duty ratios of 0.7 and 0.4. 8 M

5. a) Draw and explain the speed torque curves with variable frequency control for two different modes.

i) Operation at constant flux.

ii) Operation at constant (v/f) ratio. 8 M

b) Explain the advantages of variable frequency drives. 8 M

6. a) Deduce Park's transformations relating the 3-Φ currents of a synchronous machine to its corresponding d-q axes currents. Express 3-Φ currents in terms of d-q axes currents and its inverse. 8 M

b) With the help of a block diagram, explain the principles of vector control and show how they are applied to machine d-q model. 8 M