B.Tech III Year II Semester (R13) Regular & Supplementary Examinations May/June 2017
POWER SEMICONDUCTOR DRIVES
(Electrical and Electronics Engineering)

Time: 3 hours   Max. Marks: 70

PART – A
(Compulsory Question)
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1   Answer the following: (10 X 02 = 20 Marks)
  (a)   Draw the speed Vs torque and power characteristics of a separately excited DC motor.
  (b)   Mention the two draw backs if armature current in a DC motor is discontinuous.
  (c)   When do you use controlled converter in the armature circuit and fixed excitation voltage in field winding?
  (d)   Mention the two methods of chopper control.
  (e)   Mention the two advantages of AC drives.
  (f)   What condition to be satisfied to work a DC motor in regenerative braking mode?
  (g)   Mention the two methods which are applicable for speed control of squirrel cage I.M.
  (h)   What is the need of v/f control in an I.M?
  (i)   What is the effect on p.f at starting and power input to the motor when an IM is operated with reduced voltage and frequency operation?
  (j)   What are the two possible modes of operation is possible through cycloconverters?

PART – B
(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2   With relevant circuit diagram, explain the principle of operation of $3\emptyset$ Full Converter fed DC drive.

OR

3   A separately excited DC motor, operating from a $1\emptyset$ half controlled converter at a speed of 140 rpm, has an input voltage of 330 Sin 314t and a back emf 80 V. The SCR's are fixed symmetrically at $\alpha = 30°$ in every half cycle and the armature has a resistance of $4\,\Omega$. Calculate the average armature current and the motor torque.

UNIT – II

4   With necessary diagram, explain the four quadrant operation of a DC drive and mention the conditions to be satisfied in each quadrant.

OR

5   With relevant circuit and operating characteristics, explain the operation of $1\emptyset$ dual converter fed DC drive.

UNIT – III

6   With relevant circuit and waveforms, explain the motoring control of DC chopper fed series motor drive.

OR

7   A DC chopper is used for regenerative braking of a separately excited DC motor. The supply input voltage is 400 V, R_a = 0.2 Ω, K_m = 1.2 V-sec/rad. The average armature current during regenerative braking is kept constant at 300 A. For a duty cycle of 60% of chopper, determine the following: (i) Power returned to supply. (ii) Minimum and maximum braking speeds. (iii) Speed during regenerative braking.

UNIT – IV

8   With the help of block diagram, explain the closed loop operation of IM drive including both current and speed loop.

OR

9   With relevant circuit and characteristics, explain the operation of Static Kramer drive.

UNIT – V

10   Draw the circuit diagram and explain the operation of Self Controlled Synchronous motor drive employing load commutated inverter.

OR

11   A 6 MW, 3-phase, 11 KV, y–connected, 6-pole, 50 Hz, 0.9 leading p.f synchronous motor has $X_s = 9\,\Omega\ and\ R_s = 0$. Rated field current is 50 A, machine is controlled by variable frequency control at constant (v/f) ratio up to the base speed and at constant voltage above base speed. Determine torque and field current for the rated armature current 750 rpm and 0.8 leading p.f.

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