R15

B.Tech III Year II Semester (R15) Regular Examinations May/June 2018
POWER SEMICONDUCTOR DRIVES
(Electrical & 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) How do you classify electric drives?
  (b) What are the basic elements of electric drive?
  (c) What is the principle of regenerative braking mode?
  (d) If a dual converter is used as a drive, how do you set the firing angles to operate in the third quadrant?
  (e) What are the differences between chopper fed DC motor and converter fed DC motor?
  (f) In chopper fed DC motor, how can you achieve continuous current operation?
  (g) What are the advantages of AC drives?
  (h) In stator frequency control of a 3-phase induction motor, why the ratio V/F is maintained constant for speeds below base speed.
  (i) What do you mean by self control of synchronous motor?
  (j) Name some applications of synchronous motors.

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

UNIT – I

2   Describe the working of a single-phase semi converter fed separately-excited DC motor with relevant waveforms and expressions. State the assumptions made.
OR
3   Derive the expression for torque of a DC series motor. Also draw and explain its speed-torque characteristics.

UNIT – II

4 (a) Draw neatly the block diagram of closed loop operation of DC motor.
   (b) Write short note on plugging.
OR
5   A 200 V, 1000 rpm, 10A separately-excited DC motor is fed from a single phase full converter with AC source voltage of 230 V, 50 Hz. Armature circuit resistance is 1Ω. Armature current is continuous. The motor is controlled in regenerative braking mode. For a firing angle of 120° determine: (i) The power returned to the supply. (ii) Speed during regenerative braking.

UNIT – III

6   A dc series motor, fed from 40 V dc source through a chopper, has the following parameters: -
   $r_a = 0.05\Omega, \quad r_s = 0.07\Omega$
   $k = 5 \times 10^{-3} \, Nm/amp^2$
   The average armature current of 200 A is ripple free. For a chopper duty cycle of 60%, determine: (i) The input power from the source. (ii) Motor speed. (iii) Motor toque.
OR
7   With neat circuit diagram and waveforms, explain the four quadrant chopper fed DC separately excited motor.

UNIT – IV

8   What is slip power recovery scheme? What are its types? Explain any one with neat diagram.
OR
9   Write short on the following: (i) PWM control of inverter. (ii) V/F control of induction motor.

UNIT – V

10   With neat circuit diagram, explain the operation of load commutated CSi fed synchronous motor.
OR
11 (a) Briefly explain about variable frequency control of synchronous motor.
    (b) List some of the applications of synchronous motors.
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