

B.Tech III Year II Semester (R15) Regular Examinations May/June 2018

**POWER SEMICONDUCTOR DRIVES**

(Electrical &amp; 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**

- (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  $1\Omega$ . Armature current is continuous. The motor is controlled in regenerative braking mode. For a firing angle of  $120^\circ$  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: -

$$r_a = 0.05\Omega, \quad r_s = 0.07\Omega$$

$$k = 5 \times 10^{-3} \text{ Nm/amp}^2$$

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 torque.

**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.