(b) Draw a neat circuit diagram and explain the working of Self controlled synchronous motor drive using load commutated inverter. 6

8. (a) What are the main features of stepper motor which are responsible for its widespread use. 7

(b) Draw a block diagram and explain solar pump drive using battery. What are the advantages and disadvantages of using a battery in solar pump drive ? 6

9. (a) Explain in brief 25 kV ac traction using transformer with tap changer. 7

(b) Discuss the operation of dc traction using VSI Fed Induction motor drive. How composite braking is carried out ? 6

10. Write short notes :—

(a) Brushless DC motor. 7

(b) Cycloconverter fed synchronous motor drive. 7

Faculty of Engineering & Technology

Eighth Semester B.E. (Electrical)/Eighth Semester B.E. P.T. (Electrical) Examination

POWER SEMICONDUCTOR BASED DRIVES

Sections—A & B

Time : Three Hours] [Maximum Marks : 80

INSTRUCTIONS TO CANDIDATES

(1) All questions carry marks as indicated.

(2) Answer **THREE** questions from Section—A and **THREE** questions from Section—B.

(3) Assume suitable data wherever necessary.

(4) Illustrate your answers wherever necessary with the help of neat sketches.

SECTION—A

1. (a) A motor is used to drive a Hoist. Motor characteristics are given by :

Quadrants I, II, and IV, $T = 200 - 0{\cdot}2\ N\ \mu\text{-m}$

Quadrants II, III, and IV, $T = -200 - 0{\cdot}2\ N,\ \mu\text{-m}$

where N is speed in rpm when hoist is loaded, the net load torque T_l = 100 N-m and when it is unloaded, net load torque T_l = – 80 N-m. Obtain the equilibrium speeds for operations in all the four quadrants. 7

(b) Explain how following speed transitions are carried out :—

(i) Increase in the speed in same direction.

(ii) Decrease in the speed in same direction.

(iii) Speed reversal. 6

2. (a) A 220 V, 1500 rpm, 50 A separately excited dc motor with armature resistance of 0·5 ohm, is fed from a 3-phase fully controlled converter. Available ac source has a line voltage of 440 V, 50 Hz. A star-delta connected transformer is used to feed the armature so that motor terminal voltage equals rated voltage when converter firing angle is zero.

(i) Calculate transformer turns ratio.

(ii) Determine the firing angle when motor is running at – 800 rpm and twice the rated torque. 7

(b) Draw a neat circuit diagram and explain the operation of chopper controlled dc drives. Also draw the necessary waveform. 6

3. (a) Draw a neat circuit diagram and explain the working of static Scherbius drive. 7

(b) Briefly explain the working of current source inverter fed Induction motor drive. 6

4. (a) Explain in brief the steady state stability of motor-load system. 7

(b) Draw a neat circuit diagram and explain the working of Fractional hp motors. 6

5. Write short notes :—

(a) Energy conservation in electrical drives. 7

(b) Components of load torque. 7

SECTION—B

6. (a) Describe a chopper controlled dc traction drive with composite braking. How is it ensured to minimise energy dissipation in dynamic braking. 7

(b) Discuss 25 kV ac traction using thyristor converted with sequence control. Also draw the relevant waveforms and circuit diagram for the stage converter. 6

7. (a) Explain in brief the difference between run synchronous mode and self control mode for variable frequency control of synchronous motor. 7