

(DEE 413)

B.Tech. DEGREE EXAMINATION, MAY - 2015

(Examination at the end of Fourth Year)

ELECTRICALS AND ELECTRONICS

Paper - III : Industrial Drives

Time : 3 Hours

Maximum Marks : 75

Answer Question No.1 Compulsory

(15)

Answer ONE question from each unit

(4 × 15 = 60)

- 1) a) What are the advantages of electric drives?
- b) What are the types of electric drives?
- c) What is the torque expression for dc series motor?
- d) Explain the classification of load torques.
- e) What are the advantages of closed-loop control of drives?
- f) What are the various methods of speed control of dc motors?
- g) What is the rms output voltage equation of a single phase half controlled converter?
- h) What is torque? Write the expression for torque in 3 phase induction motor.
- i) Give the number and names of the quadrants in which type A chopper works.
- j) Define slip and slip speed. Also write the expressions for the same.
- k) What is the relation between voltage and frequency in constant power region?
- l) What is meant by self control of synchronous motor?
- m) What are the advantages of synchronous motor over an induction motor when operated with variable frequency?

- n) In static Kramer drive, motor turns ratio is 0.5, the firing angle is 90 degrees. Calculate the motor slip.
- o) Define and explain dynamic torque.

UNIT - I

- 2) Explain in detail about modes of operation of electric drives.

OR

- 3) Explain in detail about characteristics of different types of loads.

UNIT - II

- 4) Two independent single-phase semi-converters are supplying the armature and field circuits of the separately excited dc motor for controlling its speed. The firing angle of the converter supplying the field, adjusted such that maximum field current flows.

The machine parameters are : armature resistance of 0.25Ω , field circuit resistance of 147Ω , motor voltage constant $K_v = 0.7032 \text{ V/A-rad/s}$. The load torque is $T = 45 \text{ N-m}$ at 1000 rpm. The converter is fed from a 208 V, 50 Hz AC supply. The friction and windage losses are neglected.

Find

- a) the field current of the field and armature circuits are sufficient enough to make the armature and field currents continuous and ripple free.
- b) the delay angle of the armature converter,
- c) the input power of the armature circuit converter.

OR

- 5) a) Explain the principle of closed loop control of dc drive using suitable block diagram.
- b) Distinguish between class-A and class-B choppers with suitable examples of speed control of motors.

UNIT - III

- 6) a) Explain why stator voltage control is suitable for speed control of induction motors in fan and pump drives. Draw a neat circuit diagram for speed control scheme of 3 phase induction motor using AC Voltage controller.

OR

- 7) Explain various speed control methods of induction motor applicable for both squirrel cage and slip ring induction motors.

UNIT - IV

8) Describe the open-loop and closed loop methods of speed control of a synchronous motor using VSI.

OR

9) Describe separate controlled mode and self-controlled mode of operation of a synchronous motor drive in detail and compare them.

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