Code No: 157EM

R18

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year I Semester Examinations, January/February - 2023
ELECTRIC DRIVES AND CONTROL
(Civil Engineering)

Time: 3 Hours   **Max.Marks:75**

Note: i) Question paper consists of Part A, Part B.
     ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
     iii) In Part B, Answer any one question from each unit. Each question carries 10 marks
        and may have a, b as sub questions.

PART – A

(25 Marks)

1.a) Draw a schematic diagram of Electric drive. [2]
  b) Write various losses in Electric drive. [3]
  c) What are the advantages of electrical braking over mechanical braking? [2]
  d) What are the components of the load torque? [3]
  e) State the advantages of closed loop of operation d.c drives. [2]
  f) Mention the advantages of chopper fed drives. [3]
  g) What is plugging? [2]
  h) Write short notes on dynamic braking and regenerative braking. [3]
  i) What is the necessity of pf Improvement in Electric drives? [2]
  j) What are the advantages of using efficient converters? [3]

PART – B

(50 Marks)

2.a) State essential parts of electrical drives and what are the functions of a power modulator?
  b) Write a brief note on main factors which decide the choice of electrical drive for a given
    application? [5+5]

OR

3.a) Write a brief note on the motors employed in variable speed drives.
  b) Write a brief note on current status of dc and ac drives. [5+5]

4.a) Define active and passive load torques. What are the differences between two?
  b) Explain in detailed the reasons for using load equalizations in an electric drive. [5+5]

OR

5.a) Derive fundamental torque equation of an electric drive.
  b) What type of closed loop speed control schemes are used in multi motor drive? Explain in
    detailed. [5+5]

6.a) Describe the single phase half wave converter feeding a separately excited dc motor with waveforms and appropriate expressions

b) A separately excited dc motor, operating from a single phase half controlled bridge at a speed of 1400 rpm, has an input voltage of $330 \sin 314t$ and a back emf of 80 V. The SCRs are fired symmetrically at 45 degrees in very half cycle and the armature has a resistance of 4 ohms. Calculate the average armature current and the motor torque. [5+5]

OR

7.a) Describe with appropriate voltage and current waveforms, the working of a single phase full converter fed separately dc motor drive. Describe also an expression for its input pf. State the assumptions made.

b) The speed of a 15 hp, 220 V, 1000 rpm dc series motor is controlled using a 1-phase half controlled bridge converter. The combined armature and field resistance is 0.2 ohms. Assuming continuous and ripple free motor current and speed of 1000 rpm and $k = 0.03 Nm/amp^2$, determine (i) motor current (ii) motor torque for a firing angle 30 degrees. AC voltage is 250 V. [6+4]

8.a) Describe stator voltage control technique for the speed control of a 3-phase induction motor?

b) Induction motor speed control with constant supply voltage and reduced supply frequency is rarely used in practice. Justify this state with suitable example. [6+4]

OR

9.a) Explain V/f control for a 3-phase induction motor for its speed control. Enumerate its advantages.

b) A 3 phase, 4 pole, 50 Hz Induction motor has rotor resistance of 0.2 ohm and stand still reactance of 0.1 ohm. At full load it operates at a slip of 4%. If the voltage is reduced to 50 %, at what speed will the motor operate with full load torque applied. [6+4]

10.a) List the measures that could be taken to conserve energy in electrical drives?

b) Explain how the variable speed drive allows saving of energy in pump drives. [5+5]

OR

11.a) How the variable voltage operation of an induction motor in applications involving motor on NO load or light loads for prolonged periods provides energy saving? What are the factors which influence the amount of energy saved?

b) Why energy conservation is important in electrical drives? [6+4]

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