Code No: 157EM

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year I Semester Examinations, February/March - 2022
ELECTRIC DRIVES AND CONTROL
(Computer Science and Engineering)

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

Answer any Five Questions
All Questions Carry Equal Marks
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1.a)   What are the advantages of electric drives to mechanical drives?
  b)   With a neat block diagram, explain the different components of an electric drive.   [7+8]

2.a)   What are the functions of a power modulator in an electric drive?
  b)   Compare AC drives and DC drives. Discuss factors to be taken into account in selecting an electric drive.   [7+8]

3.a)   Explain the operation of a closed-loop speed control scheme with an inner current control loop. What are the various functions of the inner current control loop?
  b)   A 220V, 1200 rpm, 10A separately, excited dc motor is fed from a single-phase full converter with an ac source voltage of 230V, 50Hz. Armature circuit resistance is 1Ω. The Armature current is continuous. Calculate firing angle for
       i) rated motor torque at 600 rpm
       ii) half the rated motor torque at (-600) rpm.   [8+7]

4.a)   What is steady-state stability? What is the condition for the system's steady-state stability with respect to electric drives?
  b)   Explain different modes of operation of an electric drive.   [8+7]

5.a)   Explain in detail any one method of electrical braking in DC machines.
  b)   Explain the operation of a single-phase full converter fed separately excited DC motor drive.   [6+9]

6.a)   Describe the working of the step-down DC chopper, with the help of a suitable circuit diagram and wave-form diagrams. State the relation between output and input voltages. How is the speed of a DC motor controlled using a step-down chopper?
  b)   A 100 V d.c shunt motor has armature resistance and field resistances of 0.4 ohms and 100 ohms respectively. At a particular constant torque load, it takes a current of 25 A at the speed of 1200 r.p.m. A chopper is used to control the speed of the motor. Find T_{ON} to reduce the speed to 800 r.p.m. at a chopper frequency of 500 Hz.   [8+7]

7.   Sketch and explain the circuit, using a thyristor controller, to control the speed of a three-phase induction motor by varying the stator voltage. Mention the merits and demerits of this method. Also, sketch and explain the torque-speed characteristics when stator voltage control is used.   [15]

8.   What are the power factor improvement methods used for energy conservation in drives? Explain in detail any two ways in which it can be achieved.   [15]

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