CODE: 17CD02103

M. Tech I Year I Semester Supplementary Examinations, May 2018
SOLID STATE DC DRIVES
(PE & D)

Time : 3 hours   Max Marks : 60

Answer all **five** units. (5 x 12 = 60 Marks)

UNIT-I

1. (a) Why is armature control referred as constant torque control? Explain.

    (b) What are the different components of load torque? Briefly explain about them.
         Also draw the speed torque characteristics of each component.

OR

2. (a) Analyze the multi quadrant operation of elevator drive system using a four
         quadrant diagram. State assumptions made and convention used.

    (b) Mention any four advantages of electric drives.

UNIT-II

3. (a) A single phase fully controlled rectifier feeds the armature of the separately
         excited motor. The motor operates in continuous conduction mode. Derive an
         expression in terms of firing angle to express the armature voltage.

    (b) Discuss about the effect of current ripple on the performance of controlled
         rectifier fed dc motor.

OR

4. (a) A 220V, 1500rpm, 50A separately excited motor has armature resistance of
         0.5ohm, is fed from a single phase, circulating current dual converter. The ac
         source voltage is 165V(line), 50Hz. Determine the converter firing angles for the
         following operating points:
           i) Motoring operation at rated motor torque and 1000 rpm
           ii) Braking operation at rated motor torque and 1000 rpm
           iii) Motoring operation at rated motor torque and -1000 rpm
           iv) Braking operation at rated motor torque and -1000 rpm

    (b) Depict the relation between firing angle and armature voltage of :
           i) Half-wave controlled dc motor
           ii) Full-wave controlled dc motor
         Also write brief note on the characteristics drawn.

UNIT-III

5. (a) A 230V, 960rpm and 200A separately excited dc motor has Ra=0.02Ω. The
         motor is fed from a chopper which provides both motoring and braking
         operations. The source has a voltage of 230V. Assuming continuous conduction:
         i) Find the duty ratio of chopper for motoring operation at rated torque and
             350rpm
         ii) Find duty ratio of chopper for braking operation at rated torque and 350rpm

    (b) Dynamic braking of dc motor need to be implemented using a chopper circuit
         and appropriate braking resistance. Suggest a chopper topology to implement the
         circuit and briefly explain the operation.

OR

6. With neat diagrams, explain the four quadrant operation of a class-E chopper fed separately excited motor.

UNIT-IV

7. Discuss the operation of closed loop control of separately excited motor with proportional controller.

OR

8. Explain the operation of closed loop control of separately excited motor with PI controller.

UNIT-V

9. Discuss the operation of microcomputer control of reversible drives.

OR

10. (a) With necessary diagrams, explain the principle of operation of phase locked loops.

(b) Draw the block diagram of a reversing dc drive controlled by a microcomputer control system.

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