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Question Paper Code : 51510

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Sixth Semester

Electrical and Electronics Engineering

EE 2352/EE 62/10133 EE 602 – SOLID STATE DRIVES

(Regulations 2008/2010)

(Common to PTEE 2352/10133 EE 602 – Solid State Drives For B.E. (Part-Time) Sixth Semester Electrical and Electronics Engineering)

(Regulations 2009/2010)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. What are the components of load torque ?
2. Compare Acceleration and Deceleration mode of DC drives.
3. When discontinuous conduction is expected in dc drives ?
4. Write down the speed torque equation of dc separately excited motor drive.
5. Write the need of Software packages in DC drives.
6. What is the function of current limiter ?
7. What do you mean by Energy efficient drive ?
8. Why is stator voltage is maintained const for speed above base speed ?
9. Permanent magnet synchronous Motors.
10. Why is damper winding absent in self controlled Synchronous motors ?

PART – B (5 × 16 = 80 marks)

11. (a) (i) Write in detail about multi quadrant operation of DC drive system. (8)
- (ii) Draw the typical load torque characteristics of (a) diesel electric locomotive (b) fan (c) hoist and (d) excavators. (8)

OR

- (b) (i) What do you mean by “Steady state stability”. Derive the condition for steady state stability. (8)
- (ii) A horizontal conveyer belt is moving at a speed of 1.2 m/s with a transport material at the rate of 100 Tonnes per hour. The Belt is 220 meters long and driven by a motor at 1200 rpm. Calculate the torque that the Motor should develop to accelerate the belt from standstill to full speed in 8 sec. Moment of Inertia of the Motor is 0.1 kg/m^2 . (8)
12. (a) (i) Derive the steady state analysis of single phase fully controlled converter fed separately excited dc drive in continuous and discontinuous modes for motoring operation. (8)
- (ii) Describe the operation of class C chopper fed dc motor drives. (8)

OR

- (b) (i) Compare the performance of controller fed and converter fed Dc motor drive systems. (8)
- (ii) A chopper is used to control a separately excited Dc Motor with the supply voltage of 230 V, $T_{\text{on}} = 20 \text{ ms}$, $T_{\text{off}} = 7 \text{ ms}$. Assuming continuous conduction of motor current, calculate the average load current when the motor Speed is 3000 rpm. Also assume voltage constant $K_v = 0.5 \text{ v/rad/sec}$ and $R_a = 5 \Omega$. (8)

13. (a) (i) Derive the Transfer function of DC Motor - Load system with armature Voltage control. (8)
- (ii) How do you select the rating of the converter based on the drive application ? (8)

OR

- (b) (i) Write in detail about the Design of Controllers. (8)
- (ii) Derive the closed loop Transfer function of DC Motor with current feedback. (8)

14. (a) (i) Explain the constant v/f control of Induction motor drives with speed torque characteristics. (8)
- (ii) Discuss how the speed of a three phase induction motor can be controlled from rotor circuit. (8)

OR

- (b) (i) Explain Stator voltage control and Field weakening mode of Induction Motor Drives. (8)
- (ii) Compare the Current and Voltage source Inverters fed Induction Motor drives. (8)

15. (a) (i) Discuss with phasor diagram, the power factor control of synchronous motor. (8 + 8)
- (ii) Explain marginal angle control.

OR

- (b) Discuss briefly about the self controlled Synchronous Motor drives. (16)