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Question Paper Code : 21404

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Sixth Semester

Electrical and Electronics Engineering

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

(Regulation 2008/2010)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. When does an equilibrium point be stable in speed-torque plane of motor-load system?
2. What are the components of load torque?
3. Why does the armature voltage control is not preferred for the speeds above the rated value in dc motors?
4. What is CLC in chopper fed dc drives?
5. What is field weakening mode control?
6. Name any four simulation software packages that can be used for electrical drives.
7. What is slip power recovery scheme?
8. What is meant by super synchronous operation?
9. When is a synchronous motor said to be self-controlled?
10. What are the advantages of PMSM?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive the fundamental torque equations of motor-load system? (6)
(ii) Explain the multi quadrant operation of a motor driving a hoist load. (10)

Or

- (b) (i) Describe the typical load-torque characteristics of electrical drives. (8)
(ii) Describe the various modes of operation of an electrical drive. (8)

12. (a) Describe the steady state analysis of single phase fully controlled converter fed separately excited dc motor drive in continuous and discontinuous conduction modes. (16)

Or

- (b) (i) Explain the operation of four quadrant chopper fed dc drives. (8)
- (ii) A chopper used to control the speed of a separately excited dc motor, has supply voltage of 230V, $T_{on} = 15\text{ms}$, $T_{off} = 5\text{ms}$. Assuming continuous conduction of motor current, calculate the average load current when the motor speed is 3000 rpm. Assume voltage constant $K_v = 0.5\text{V/rad/sec}$ and $R_a = 4\Omega$. (8)
13. (a) Derive the transfer function of dc motor-load system with converter fed armature voltage control. (16)

Or

- (b) (i) Give the design procedure for speed controller of an electrical drive system. (8)
- (ii) Mention the factors involved in converter selection and equations involved in controller characteristics. (8)
14. (a) (i) Explain stator voltage control of induction motor drives. (6)
- (ii) Explain v/f control of induction motor drives. (10)

Or

- (b) Describe the closed loop speed control of VSI fed and CSI fed induction motor drives. (16)
15. (a) (i) Describe the open loop v/f control of VSI fed synchronous motor drives. (8)
- (ii) Explain power factor control of synchronous motor drives. (8)

Or

- (b) With a neat block diagram explain the closed loop speed control of synchronous motor drive. (16)