Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 13434

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2012.

Sixth Semester

Electrical and Electronics Engineering

EE 1351 — SOLID STATE DRIVES

(Regulation 2004/2007)

(Common to B.E. (Part-Time) Fifth Semester, Regulation 2005)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the advantages of electrical drives over other types of drives?

2. What is meant by regenerative braking?

3. State the condition for continuous current conduction mode for DC motor.

4. What are the types of control strategies in a DC chopper?

5. Why stator voltage control is preferred for fan and pump drives?

6. What is meant by constant slip speed control?

7. What is self-control of synchronous motor drive?

8. Mention the types of PMSM.

9. Write the purpose of current limit controller in a drive system.

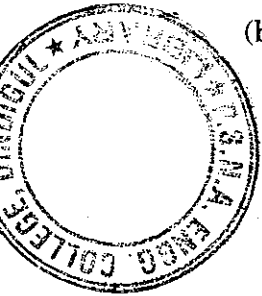10. Give any four factors to be considered for the selection of controller.

PART B — (5 × 16 = 80 marks)

11. (a) (i)   Classify and explain various types of loads of electrical drive based on the Speed – Torque characteristics.   (8)

        (ii) Explain the Speed — Torque characteristics of various electrical motors.   (8)

Or

(b) (i) Describe about constant – torque drive and constant power drive. (8)

(ii) Explain the transient modes of operation of electrical drive. (8)

12. (a) Explain the operation of single phase fully controlled converter fed separately excited dc motor with neat waveforms and derive the torque speed characteristics. (16)

Or

(b) (i) Explain the operation of four quadrant chopper control in dc motor drives. (8)

(ii) A 250 V separately excited dc motor has an armature resistance of 2.5 Ω. When driving a load at 600 r.p.m. with constant torque, the armature takes 20 A. This motor is controlled by a chopper circuit with a frequency of 400Hz and an input voltage of 250 V. What should be the value of the duty ratio if one desires to reduce the speed from 600 to 400 r.p.m. with the load torque maintained constant? (8)

13. (a) Explain in detail about constant slip speed control of induction motors. (16)

Or

(b) (i) Derive the speed – torque characteristics of static slip power recovery scheme based induction motor drive. (8)

(ii) Explain the modes of operation of static Scherbius drive. (8)

14. (a) (i) Describe the open loop v/f speed control scheme of synchronous motor drive. (8)

(ii) Describe with a neat diagram the marginal angle constant scheme of synchronous motor drive. (8)

Or

(b) Explain in detail about PMSM drive. (16)

15. (a) Derive the transfer function of armature controlled separately excited dc motor — load system. (16)

Or

(b) Describe with necessary diagrams the design of current and speed controller. (16)

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