

LIB

23/12/13 FN

Reg. No. :

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Question Paper Code : 31404

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 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. Define dynamic torque.
2. What are the three modes of operation of an electrical drive?
3. Write down the speed-torque relation for single phase fully controlled converter fed dc motor in continuous conduction mode.
4. What is CLC in chopper fed drives?
5. What is field weakening mode control in dc drives?
6. Name any two simulation packages used for drive systems.
7. What are the drawbacks of stepped wave inverter fed drives?
8. What are the advantages of static rotor resistance control over conventional rotor resistance control?
9. What are the modes of adjustable frequency control in synchronous motor drives?
10. When can a synchronous motor be load commutated?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Drive the fundamental torque equations for a motor-load system. (6)
(ii) Explain in detail about steady state stability of equilibrium point in electrical drive. (10)

Or

- (b) (i) Classify the electrical loads according to the speed-torque characteristic and explain with examples. (8)
(ii) Explain in detail about four quadrant operation of a hoist load. (8)

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

Or

- (b) A 220V, 1500rpm, 50A separately excited motor with armature resistance of 0.5Ω , is fed from a 3-phase fully-controlled rectifier. Available ac source has a line voltage of 440V, 50Hz. A star delta connected transformer is used to feed the armature so that motor terminal voltage equals rated voltage when converter firing angle is zero.
- (i) Calculate transformer turns ratio.
- (ii) Determine the value of firing angle when
- (1) Motor is running at 1200 rpm and rated torque;
 - (2) When motor is running at 800 rpm and twice the rated torque.
- Assume continuous conduction. (16)

13. (a) Drive the transfer function of a separately excited dc motor-load-converter system. (16)

Or

- (b) Discuss the current controller design using (i) P controller and (ii) PI controller for a separately excited dc motor drive system. (16)

14. (a) (i) Explain about variable frequency control in induction motor drives. (8)
- (ii) A three phase 60KW, 4000 rpm, 460V, 60Hz, 2 pole star connected induction motor has the following parameters: $R_s = 0$, $R_r = 0.28\Omega$, $X_s = 0.23\Omega$, $X_r = 0.3\Omega$ and $X_m = 11\Omega$. The motor is controlled by varying the supply frequency. If the breakdown torque requirement is 70 Nm. Calculate supply frequency and speed ω_m at the maximum torque. (8)

Or

- (b) Explain about VSI induction motor drives and also closed loop control for VSI induction motor drives. (16)

15. (a) (i) Explain the open loop V/f speed control of multiple permanent magnet synchronous motors. (8)
- (ii) Explain with the block diagram, the torque angle control of self controlled synchronous motor drive. (8)

Or

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