

UNIVERSITY OF KERALA
MODEL QUESTION PAPER
VII SEMESTER B.TECH DEGREE
SUBJECT – 13.703: POWER SEMICONDUCTOR DRIVES(E)

TIME: 3 Hrs.

Max. Marks: 100

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PART A

(Answer all questions from PART A)

1. Discuss steady state stability criteria for a motor load system.
2. Draw and explain the torque speed characteristics of viscous friction load and fan type load.
3. Explain two quadrant control of a chopper fed dc motor drive.
4. What are the advantages of current source inverter drives.
5. Write a short note on traction drives. **(5x4=20 Marks)**

PART B

Answer any one full question from each module

Module - I

6.a) Explain four quadrant operation of a motor driving a hoist load. (10 Marks)

b) A motor drives two loads. One has rotational motion. It is coupled to the motor through a reduction gear with $a=0.1$ and efficiency of 90%. The load has a moment of inertia of 7 kg.m^2 and a torque of 10 Nm. Other load has translational motion and consists of 20 kg weight to be lifted up at a uniform speed of 15 m/s. Coupling between this load and motor has an efficiency of 85%. Motor has an inertia of 1.2 kg m^2 and runs at a constant speed of 1000 rpm. Determine equivalent inertia referred to the motor shaft and power developed by the motor. (10 Marks)

OR

7. a) With block diagram explain the closed loop control scheme used in electrical drives.

(10 Marks)

- b) Explain the operation of single phase to single phase step down cyclo converter.
(10 Marks)

Module – II

8. a) Draw and explain the forward motoring and regenerative braking operation of a chopper fed d.c. motor. (10 Marks)
- b) A 220V, 1500rpm, 10A separately excited dc motor is fed from a single phase fully controlled rectifier with an ac source voltage of 230V, 50Hz. $R_a = 2\Omega$. Conduction can be assumed to be continuous. Calculate firing angles for
- (a) half the rated motor torque and 500 rpm.
- (b) rated motor torque and (-1000) rpm (10 Marks)

OR

9. a) Explain how the speed of a separately excited dc motor can be controlled in all the four quadrants using a dual converter, when the dual converter is operating in circulating current mode. (10 Marks)
- b) A 230V, 1200rpm, 15A separately excited motor has an armature resistance of 1.2Ω . Motor is operated under dynamic braking with chopper control. Braking resistance has a value of 20Ω . (i) calculate duty ratio of chopper for motor speed of 1000 rpm and braking torque of 1.5 times rated motor torque. (ii) what will be the motor speed for duty ratio of 0.5 and motor torque equal to its rated torque. (10 Marks)

Module -III

10. a) Discuss the operation of a voltage source inverter fed 3 phase induction motor. (10 Marks)
- b) What is meant by slip power recovery scheme. Explain what are its advantages. (10 Marks)

OR

11. a) Explain the stator voltage control method for the speed control of an induction motor.

What are the disadvantages of this method. (10 Marks)

b) Explain the variable frequency control of induction motor. Why it yields high torque to current ratio during starting. (10 Marks)

Module -IV

12. a) Explain the modes of operation of Switched reluctance motor drive. (10 Marks)

b) Explain why energy conservation is important in electrical drives, what are the measures to be taken to conserve energy in electrical drives. (10 Marks)

OR

13. a) Explain the bipolar drive for stepper motors. (10 Marks)

b) Explain the sinusoidal type of brushless dc motor drives. (10 Marks)