



Printed Pages : 4

TEE702

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0201

Roll No.

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B.Tech

(SEM VII) ODD SEMESTER THEORY EXAMINATION 2009-10
ELECTRIC DRIVES

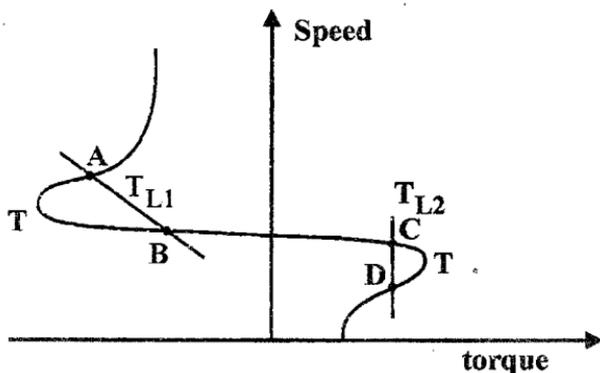
Time : 3 Hours]

[Total Marks : 100

Note : All five questions are compulsory.

1 Attempt any four parts : 5×4=20

- (a) State essential parts of electrical drives. What are the functions of a power modulator ?
- (b) How do you define passive load torques and active load torques ? What are the differences between the two ?
- (c) Figure below shows plots of speed vs motor and load torques. Comment on the stability of the operating points A, B, C and D.



- (d) What are the reasons for using load equalization in a electrical drive ?
- (e) A motor equipped with a flywheel has to supply a load torque of 600 N-m for 10 seconds followed by a no load period long enough for the flywheel to regain its full speed. It is derived to limit the motor torque to 450 N-m. What should be the moment of inertia of the flywheel? The no load speed of the motor is 600 rpm and it has a slip of 8% at torque 400 N-m. Assume the motor speed-torque characteristic to be a straight line in the range of operation. Motor has an inertia of 10 kg-m².
- (f) Explain the four - quadrant operation of an electrical drive.

2 Attempt any four parts :

- (a) A motor of smaller rating can be selected for a short time duty. Why ?
- (b) Explain equivalent and equivalent power methods for determination of motor rating for cyclic varying loads.
- (c) A motor has a continuous rating of 100 kW. The heating and cooling time constants are 50 and 70 mins. respectively. The motor has a maximum efficiency at 80% full load and is employed in an intermittent periodic load cycle consisting of a load period of 10 mins. followed by a no load period of 10 mins. Calculate the value of the load in kW during the load period.
- (d) Derive conditions for stability of an electric drive.
- (e) Derive expression of torque equation in case of load increasing or flywheel releasing energy.

3 Attempt any two parts :

- (a) Explain the various types of braking as used in a dc motor. What necessary modifications are required while braking a dc series motor ?
- (b) A 230 V, 870 rpm, 100 A separately excited dc motor has an armature resistance of 0.05Ω . It is coupled to an overhauling load with a torque of 400 N-m. Determine the speed at which motor can hold the load by regenerative braking.
- (c) Explain the dynamics during starting of a three phase induction motor. What are the methods of reducing energy loss during starting ? Explain.

4 Attempt any two parts :

- (a) A 220 V, 1500 rpm, 10 A separately excited dc motor is fed from a single phase fully controlled rectifier with an ac source voltage of 230 V, 50 Hz. $R_a = 2 \Omega$. Assuming continuous conduction, find the firing angles for :
- (i) Half the rated torque 500 rpm
- (ii) Rated motor torque and (-1000) rpm.
- (b) Explain the two modes in which a dual converter is used to control the dc motor speed. Which of the two methods is better and why ? Explain.

- (c) A 230 V separately excited dc motor takes 50 A at a speed of 800 rpm. $R_a = 0.4 \Omega$. This motor is controlled by a chopper with an input voltage of 230 V and frequency of 500 Hz. Assuming continuous conduction throughout, calculate and plot speed-torque characteristics for :
- Motoring operation at duty ratios of 0.6.
 - Regenerative braking operation at duty ratios of 0.7.

5 Attempt any two parts :

- Describe self-controlled and load commutated inverter controlled synchronous motor drives in detail and compare them.
- Explain the slip power recovery scheme of a three phase induction motor control. What are its advantages and disadvantages ?
- Describe the construction and principle of operation of a switched reluctance motor.

