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

PAPER ID : 0201 Roll No.

B.Tech

(SEM VII) ODD SEMESTER THEORY EXAMINATION 2009-10

ELECTRIC DRIVES

Time : 3 Hours] *[Total Marks : 100*

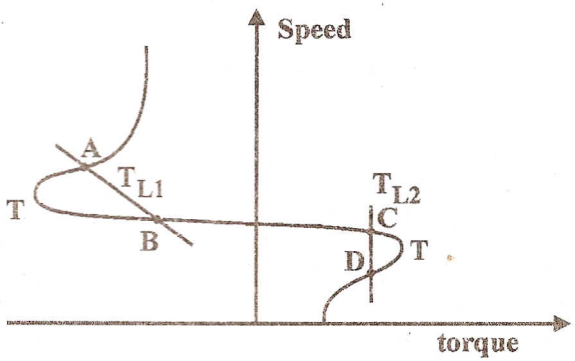
Note : *All five questions are compulsory.*

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-m^2.

(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 $\mathbf{0.05\ \Omega}$. 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 :

(i) Motoring operation at duty ratios of 0.6.

(ii) Regenerative braking operation at duty ratios of 0.7.

5 Attempt any two parts :

(a) Describe self-controlled and load commutated inverter controlled synchronous motor drives in detail and compare them.

(b) Explain the slip power recovery scheme of a three phase induction motor control. What are its advantages and disadvantages ?

(c) Describe the construction ad principle of operation of a switched reluctance motor.
