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(Following paper code and roll No. to be filled in your answer book)

Paper code: 2731 · · · · · Roll No.

B Tech
(SEM VII) Theory Examination 2011-12
ELECTRIC DRIVE

Time : 3 hours   Maximum Marks: 100

Note: Attempt all questions.

Q1. Answer any *four* parts of the following: (5x4=20)

    a) What are the different functions of power modulation? Explain in detail.

    b) Enlist the classification of electric drive and explain in detail.

    c) What are the reasons for using load equalization in electric drive?

    d) Explain the four quadrant operation of an electric drive.

    e) Differentiate individual, group and multi motor drive with applications.

   f) A drive has following equations for motor and load torque:

$$T = (1 + \omega_m) \text{ and } T_l = 3(\sqrt{\omega_m})$$

obtain the equilibrium points and determine their steady state stability.

Q2. Answer any *two* parts of the following: (10x2=20)

    a) Derive the necessary relationship between the variation of electromagnetic torque and load torque with respect to speed for a stable operation of

electric drive. Comment whether the points of equilibrium P_1 and P_2 shown in figure below are stable or not. Explain with reasons.

Motor & Load Torque Curves
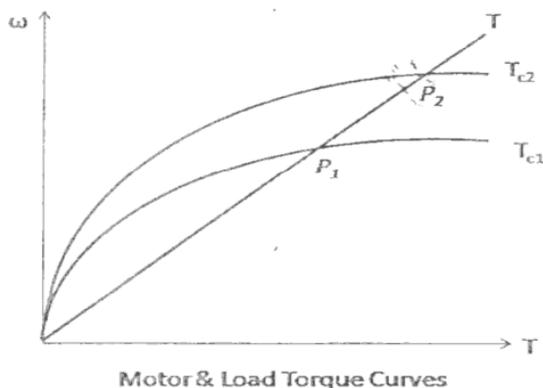
b) Show that the torque to inertia ratio referred to motor shaft and to the load shaft differ from each other by a factor of N, where N is the gear ratio. Show that the torque required to inertia referred to motor shaft or load shaft are the same.

c) Explain the thermal model of an electric motor for heating and cooling. What are continuous, short time and intermittent duties in terms of drives?

Q3. Answer any *two* parts of the following: (10x2=20)

a) Explain the types of braking of motor. Which one is usually employed and why?

b) Explain the dynamics during braking of a three-phase induction motor. What are the methods of reducing energy loss during starting? Explain.

c) A *230* volt, *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.

Q4. Answer any *two* parts of the following: (10x2=20)

a) Discuss the principle of working of a single phase semi-converter fed d.c. motor drive. Explain the advantages and disadvantages of semi-converter fed dc motor drive.

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

c) Describe the principle of operation of a switched resistance motor. What are the advantages of S.R. motor drive over other existing a.c. and d.c. motor drives?

Q5. Answer any *two* parts of the following: (10x2=20)

a) Explain the self controlled scheme for the synchronous motor control.

b) Compare the operation of USI and CSI based drives. Which will be preferred for control of speed of induction motor driving load having constant load torque?

c) Write short notes on any two of the following:
    i.   Brushless d.c. motor drive
    ii.   Vector control
    iii. Pump drive using a.c. line controller
    iv.   Synchronous motor drive applications.