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MEPE–204

M. E./M. Tech. (Second Semester)
EXAMINATION, June, 2012
(Grading/Non-Grading)
MODELING AND SIMULATION OF DRIVES
(MEPE – 204)

Time : Three Hours

Maximum Marks : {*GS : 70*, *NGS : 100*}

Note : Attempt any *five* questions. All questions carry equal marks.

1. (a) (i) Write the steps involved in determining the Mathematical model of an electrical rotating machine.

   (ii) Enlist the positive conventions used in the development of mathematical model for DC machine.

   (b) Explain reference frame theory method of modeling used of 3-phase induction motor.

2. (a) Obtain the equilibrium points and determine their steady-state stability when motor and load torques are :

$$T = -1 - 2\omega_m \text{ and } T_l = -3\sqrt{\omega_m}$$

   (b) A motor of smaller rating can be selected for a short time duty, why ? State and explain the demerits of using a motor of wrong rating.

3. (a) Explain open-loop control schemes for controlled converter fed separately excited d.c. motor.

   (b) What are the salient features of the closed-loop d.c. drive that provides four quadrant operation with d.c.-d.c. converter ?

4. (a) Devise a control scheme to maximize the efficiency of A.C. motor drive operating with a vector control strategy.

   (b) Enlist variable frequency converter used for A.C. drives. Explain *one* of them with proper circuit and wave-forms.

5. (a) Draw and explain MATLAB simulink model for a 3-phase current source inverter fed 3-phase induction motor drive.

   (b) Develop and explain MATLAB simulink model for two quadrant controlled converter, which is used to control speed of d. c. series motor.

6. (a) Draw the circuit diagram and explain the operation of closed-loop speed control with inner-current loop and field weakening for d.c. drive.

   (b) Explain variable frequency operation of synchronous motor drives. Suggest suitable converter for this.

7. (a) Explain four quadrant operation of a drive with suitable example.

   (b) Compare CSI and VSI fed induction motor drives.

8. Write short notes on any *two* of the following :

   (a) Effect of non-sinusoidal supply on induction motor.

   (b) Thermal effect on motor characteristics in electrical machines.

   (c) Linearised equation of A.C. and D.C. drives.