Seat No.: _____   *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. Sem. – IInd - Examination – June/July- 2011

Subject code: 1722902

Subject Name: Modern Electric Drives

Date:24/06/2011   **Time: 10:30 am – 01:00 pm**

Total Marks: 70

Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Notations used have usual meaning.**

Q.1 **(a)** Explain reference frame theory in brief.   **07**

(b) Explain various operating duty cycles for motor and discuss how rating of **07** motor can be obtained.

Q.2 **(a)** Explain following terms with respect to the controlled converter.   **07**

    (i)   Harmonic Factor.

    (ii)   Displacement Factor.

    (iii)   Input Supply Power Factor.

(b) The speed of a 10 kW, 230 V, 1200 rpm separately excited dc motor is **07** controlled by a single phase full wave converter. If the armature resistance of the motor is 0.5 ohm, as supply voltage is 260 V, motor voltage constant KΦ is 0.182 V/rpm. Find

    (i)   The motor torque.

    (ii)   The speed of the motor.

    (iii)   The supply power factor.

For firing angle $\alpha=30°$

OR

(b) The speed of a separately excited dc motor is controlled by a thyristorised **07** buck chopper. The dc supply voltage being 120 V, armature resistance Ra=0.3 ohm, motor constant KΦ=0.05 V/rpm, find the range of speed control and the range of duty cycle, provided the motor drives a constant torque load taking 25 A from the supply. Assume continuous armature current.

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Q.3 (a) Explain V/F control of induction motor with neat diagram. Also discuss, where this method is applicable? **07**

(b) Discuss difference between CSI and VSI based control of induction motor **07**

OR

Q.3 (a) Explain stator voltage control method for speed control of induction motor. Also discuss why it is suitable for fan type load. **07**

(b) Explain closed loop control of DC motor operated through chopper circuit. **07**

Q.4 (a) Discuss rotor resistance control of induction motor. Also draw its speed torque characteristics. **07**

(b) In Time Ratio Control of buck chopper circuit supplying to the motor load, prove that the ripple in output current will be maximum for 50% duty cycle. Assume motor draws continuous current. **07**

OR

Q.4 (a) Discuss direct vector control method for induction motor. **07**

(b) A DC motor is operated through buck chopper circuit. Obtain an expression for maximum and minimum armature current. Assume motor draws continuous armature current. **07**

Q.5 (a) Explain Direct torque control method for induction motor **07**

(b) Explain Derating of induction motor due to Harmonics present in supply. **07**

OR

Q.5 (a) Explain self synchronous operation of synchronous motor drive **07**

(b) Compare speed control of DC motor based on chopper and phase control circuit. **07**

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