Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – III • EXAMINATION – WINTER • 2013

Subject code: 730704   **Date: 28-11-2013**
Subject Name: Advanced Electrical Drives
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.

Q.1 **(a)** Discuss the suitability of different frames of references for IM in power system studies. **07**

    (b) Explain the working principle of BLDC motor. Prepare the switching table for the same. Draw the complete connection diagram of this system. **07**

Q.2 **(a)** Answer in brief
      i) Can the d-q models be used for supply unbalance studies? And will the type of winding (star or delta) of the stator connection change the dynamic model of IM? **04**
      ii) Discuss the different losses that need to be considered from performance evaluation of IM. **03**

    (b) How BLDC motor is different than a conventional DC Motor. Also compare BLDC motor with PMSM Motor. Draw the various rotor construction of PMSM Motor. **07**

OR

    (b) Attempt all
      i) Prove the power equivalence between three phase and d-q based machine model. State clearly the assumptions made. **03**
      ii) Draw the block diagram representation of direct vector control technique, clearly indicating each block thus used. **04**

Q.3 **(a)** With proper assumption, develop the mathematical model of PMSM machine. **07**

    (b) Explain the control strategy for Hysteresis motor. **07**

OR

Q.3 **(a)** Derive the torque expression for IM operating in synchronously rotating frame. **07**

    (b) Obtain the equivalent d-q model of IM in rotor reference frame. Support your answer with necessary diagrams. **07**

Q.4 **(a)** Explain the sensored and sensorless commutation techniques for Electrical Machine. **07**
Explain the Control Strategy for Four-Switch Three-Phase Brushless DC Motor Using Single Current Sensor.

    (b) Enlist the various inverter topologies for Switched Reluctance Motor. Explain the basic topology in detailed. **07**

OR

Q.4 **(a)** Enlist the different speed estimation techniques used for sensorless vector control of IM. Discuss any one of them in detail. **07**

(b) Explain the technique of Direct Vector control employed for IM. **07**

Q.5 **(a)** Explain the principle of vector control with necessary vector and block **07** diagram.

(b) Explain the control strategy for Linear Induction motor. **07**

OR

Q.5 **(a)** Draw the block diagram of sensorless vector control of PMSM motor. **07** Explain each block in detail.

(b) Discuss the voltage flux estimator employed in direct vector control. **07** Support your answer with necessary diagrams.

****