Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

ME Semester –III Examination Dec. - 2011

Subject code: 730704 **Date: 08/12/2011**
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.**
4. **Support your answers with proper diagrams.**

Q.1	**(a)**	Explain the basics construction of Brushless DC motor. Also explain how BLDC motor rotates.	**07**
	(b)	Obtain the expression of torque in terms of Flux Linkages and d-q currents for Synchronous Rotating reference frame.	**07**
Q.2	**(a)**	Describe difference between scalar and vector control method of electrical drive. Also explain the vector control principal for AC motor drive.	**07**
	(b)	Explain the Inverter Control strategy to run BLDC motor. Only prepare lookup table to run BLDC motor in clockwise and anticlockwise direction.	**07**
		OR	
	(b)	Develop the mathematical model of Induction Motor in arbitrary reference frame.	**07**
Q.3	**(a)**	Explain the indirect vector control of Induction motor with open loop flux control. Explain the each block in detail.	**07**
	(b)	Explain the Optical Encoder to sense the rotor position of Permanent Magnet Synchronous Motor.	**07**
		OR	
Q.3	**(a)**	Enlist methods of flux vector estimation in direct vector control and discuss the current model in detail.	**07**
	(b)	Draw the block diagram of sensorless vector control of PMSM. And explain the operation of this in detail.	**07**
Q.4	**(a)**	The transformation Ks is used to transform the variables f_{abc} to F_{dq0} in arbitrary reference frame. Prove that $(Ks)^T = (Ks)^{-1}$. The transformation matrix Ks is given as below.	**07**

$$\sqrt{\frac{2}{3}}\begin{bmatrix} \cos\theta & \cos(\theta-\frac{2\pi}{3}) & \cos(\theta+\frac{2\pi}{3}) \\ \sin\theta & \sin(\theta-\frac{2\pi}{3}) & \sin(\theta-\frac{2\pi}{3}) \\ 1/\sqrt{2} & 1/\sqrt{2} & 1/\sqrt{2} \end{bmatrix}$$

	(b)	Draw the inductance profile of Switched Reluctance Motor. Explain the each step of this profile in detail.	**07**
		OR	
Q.4	**(a)**	Explain the space vector theory for AC machine.	**07**
	(b)	Show different Converters for Switched Reluctance Motor Drives and explain freewheeling and regeneration capability converter in detail.	**07**
Q.5	**(a)**	Derive winding inductance and voltage equations for three phase symmetrical induction motor.	**07**
	(b)	Write a short not on Linear Induction Motor.	**07**
		OR	
Q.5	**(a)**	Discuss the vector control strategies for Synchronous Motor.	**07**
	(b)	Write a short note on Hysteresis Motor.	**07**

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