Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – WINTER • 2013

Subject code: 1720701 **Date: 24-12-2013**

Subject Name: Advanced Electrical Machines

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)**	Compare conventional DC machine and Brushless DC Machine. Discuss uni-polar and bi-polar converters used to control BLDC Motor.	**07**
	(b)	Discuss the construction and working of a brushless DC motor. State its applications	**07**
Q.2	**(a)**	State different types of stepper motor. Discuss various modes of variable reluctance stepper motor operation.	**07**
	(b)	A switched reluctance can not have the equal number of stator and rotor poles. Justify. Discuss any one of its converter and speed control.	**07**
		OR	
	(b)	Develop the equivalent circuit of two magnetically coupled circuits with the derivation of relevant flux, flux linkage, inductances, mutual inductance etc.	**07**
Q.3	**(a)**	Discuss the construction and working of a Linear induction motor. Compare the conventional Induction motor and Linear induction motor.	**07**
	(b)	Explain the concept of condition monitoring.	**07**
		OR	
Q.3	**(a)**	Discuss fault detection techniques and suggest diagnosis methods for a transformer.	**07**
	(b)	Discuss some of the special design features and benefits of an energy efficient motor.	**07**
Q.4	**(a)**	A 2-pole synchronous machine is carrying balanced 3-phase armature currents: $i_a = \sqrt{2}\, I_a\cos\omega t$, $I_b = \sqrt{2}\, I_a\cos(\omega t - 120^0)$, $I_c = \sqrt{2}\, I_a\cos(\omega t + 120^0)$. The rotor is rotating at synchronous speed 'ω' and the direct axis is aligned with the stator phase –a at time t = 0. Find the direct and quadrature axis current components.	**07**
	(b)	Define the basic rule of electromechanical energy conversion. Derive the expression for energy stored in a magnetic field.	**07**
		OR	
Q.4	**(a)**	Discuss the fixed speed and variable speed wind mills. State the role of a capacitor bank in a Sq. cage induction generator connected with an isolated load.	**07**
	(b)	Explain any two static VAR compensators suitable to wind mills.	**07**
Q.5	**(a)**	What is the significance of transformation equations in a reference-frame? Carry out transformation of a balanced set from (a,b,c) to (d,q,0) reference frame.	**07**
	(b)	Derive the voltage and winding inductance equations of an induction machine.	**07**
		OR	
Q.5	**(a)**	State advantages and disadvantages of Hybrid stepper motor. A single-stack, 8 phase (stator) multipole, stepper motor has 6 rotor teeth. The phases are excited one at a time. Determine (i) step size, (ii) steps per revolution, (iii) speed, if excitation frequency is 120 Hz.	**07**
	(b)	Discuss direct saving and pay back analysis of energy efficient motor.	**07**

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