Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– I (New course)• REMEDIAL EXAMINATION – SUMMER 2015

Subject Code: 2714504 **Date:15/05/2015**

Subject Name: Modeling and Analysis of Electric Machines

Time: 10:30 am to 1:00 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)**	Define field energy and co-energy. Derive relationship for them if current and displacement as variables and flux linkage and displacement as variables.	**07**
	(b)	Derive the expression of the Electromagnetic force and Electrostatic force for electro mechanical system having one electrical and one mechanical input.	**07**
Q.2	**(a)**	Derive winding inductance and voltage equation for induction machine. Mention assumption made for derivation.	**07**
	(b)	Derive winding inductance and voltage equations for three phase synchronous machine.	**07**
		OR	
	(b)	Explain generalized theory of rotating electrical machine and Kronôs primitive machine.	**07**
Q.3	**(a)**	Explain dynamic of permanent magnet DC machine during starting.	**07**
	(b)	Prepare time domain block diagram and derive state equation for permanent magnet DC machine.	**07**
		OR	
Q.3	**(a)**	Prepare time domain block diagram for DC. shunt machine.	**07**
	(b)	Explain the significance of Perkôs transformation in the analysis of synchronous machines.	**07**
Q.4	**(a)**	Explain the computer simulation of three phase synchronous machine into rotor reference frame using suitable block diagram.	**07**
	(b)	Derive transformation matrix Ks for transforming a stationary circuit abc variable into d_s and q_s axis variables.	**07**
		OR	
Q.4	**(a)**	Write the voltage equations in the capacitive and resistive elements together. Determine the voltages in qd0 frame and hence obtain the impedance matrix into qd0 frame.	**07**
	(b)	Develop equivalent circuit of induction machine in arbitrary reference frame.	**07**
Q.5	**(a)**	Explain the computer simulation of symmetrical induction machine in stationary reference frame using appropriate block diagram.	**07**
	(b)	Derive voltage and torque equation of Brushless DC Machine in machine variables and in rotor reference frame variables.	**07**
		OR	
Q.5	**(a)**	Derive the torque speed characteristics of PMBL machine and define common mode of operation.	**07**
	(b)	Explain the mathematical model of switch reluctance motor.	**07**

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