GUJARAT TECHNOLOGICAL UNIVERSITY
ME – SEMESTER II (NEW) – • EXAMINATION – SUMMER 2016

Subject Code: 2720715   **Date: 25/05/2016**

Subject Name: Electrical Machine Modeling and Analysis

Time:10:30 am to 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)**	Derive expression of total energy supplied to the coupling field for electromechanical system with magnetic and electric field.	**07**
	(b)	Define energy and co-energy in an electromechanical energy conversion. Derive the expression for the field energy in terms of system variables.	**07**
Q.2	**(a)**	Prove the power equivalence between three phase and d-q based machine model. State clearly the assumptions made.	**07**
	(b)	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?	**07**
		OR	
	(b)	Derive winding inductances and voltage equations for a 3 phase induction motor Mention assumptions made for derivation.	**07**
Q.3	**(a)**	Develop the mathematical model of Induction Motor in arbitrary reference frame. Support your answer with necessary diagrams and equations.	**07**
	(b)	Derive voltage equations for Synchronous machine in rotor reference frame.	**07**
		OR	
Q.3	**(a)**	Obtain the expression of torque for a three phase dynamic model of IM in terms of stator and rotor Flux Linkages rotor reference frame	**07**
	(b)	Derive the voltage equation in rotor reference frame variables of a synchronous machine.	**07**
Q.4	**(a)**	Derive torque equations for three phase induction motor machine in synchronous reference frame.	**07**
	(b)	Analysis the 3 phase induction motor performance when a three phase fault occurs at the machine terminals using dynamic model	**07**
		OR	
Q.4	**(a)**	Analysis the Synchronous machine performance when a three phase fault occurs at the machine terminals using dynamic model	**07**
	(b)	Analysis the steady state operation of synchronous machine.	**07**
Q.5	**(a)**	Explain in brief the procedure of linearization of machine equations	**07**
	(b)	Derive the torque equation in machine variables of PMBLDC machine.	**07**
		OR	
Q.5	**(a)**	Derive the voltage equation in rotor reference frame variable of BLDC Machine	**07**
	(b)	Which are the commonly used reference frames & explain in brief how transformation takes places between reference frames	**07**

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