Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME SEMESTER – I EXAMINATION – SUMMER 2017

Subject Code: 2714504 **Date:11/05/2017**

Subject Name: Modeling and Analysis of Electric Machines

Time:02:30 p.m. to 05:00 p.m. **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)**	For a doubly excited magnetic system, derive the relation for the magnetic stored energy in terms of reluctance.	**07**
	(b)	Compare the Electromagnetic force and Electrostatic force and derive the expression of them for electro mechanical system having one electrical and one mechanical input.	**07**
Q.2	**(a)**	Derive voltage equation to represent two magnetically coupled circuits with leakage. Assume magnetic system to be linear. Draw equivalent T-circuit with coil1 as the reference coil.	**07**
	(b)	Why reference frame theory is used in the analysis of electrical machine? Derive the transformation matrix K_s for transforming stationary circuit abc variables into to q_s and d_s axis variables.	**07**
		OR	
	(b)	Derive the voltage equations referred to stator winding of 3 phase, 2-pole and Y-connected symmetrical squirrel cage induction motor into machine variables.	**07**
Q.3	**(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)	Explain generalized theory of rotating electrical machine and Kron's primitive machine	**07**
		OR	
Q.3	**(a)**	Prepare time domain block diagram pertaining to DC series motor.	**07**
	(b)	Explain computer simulation of 3 phase 2 pole and Y connected salient pole synchronous machine.	**07**
Q.4	**(a)**	Explain the computer simulation of three phase symmetrical induction machine in balanced stator and rotor condition in arbitrary reference frame.	**07**
	(b)	Develop equivalent circuit of induction machine in the arbitrary reference frame.	**07**
		OR	
Q.4	**(a)**	Obtain the expression of torque in terms of flux linkages and d-q currents for synchronous rotating reference frame.	**07**
	(b)	Explain starting operation of shunt connected DC machine supplied from a constant voltage source.	**07**
Q.5	**(a)**	Explain the mathematical model of switch reluctance motor.	**07**
	(b)	Derive the torque speed characteristics of Permanent Magnet Brushless DC Machine and define common mode of operation.	**07**
		OR	
Q.5	**(a)**	Derive voltage and torque equations in machine variable for Permanent Magnet Brushless DC Machine.	**07**
	(b)	Derive voltage equations of salient pole synchronous machine in rotor reference-frame variables.	**07**

****