Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER I (NEW) – • EXAMINATION – SUMMER 2016

Subject Code: 2714504 Date:19/05/2016

Subject Name: Modeling and Analysis of Electric Machines

Time:02:30 pm to 05:00 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 voltage equation to represent two magnetically coupled circuits with leakage. Assume magnetic system to be linear.	**07**
	(b)	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**
Q.2	**(a)**	Develop equivalent circuit of a synchronous machine in the arbitrary reference frame.	**07**
	(b)	Transform the variables of stator reference frame into the synchronously rotating reference frame.	**07**
		OR	
	(b)	Derive the voltage equations referred to stator winding of 3 phase, 2 poles and Y-connected symmetrical squirrel cage induction motor into machine variables.	**07**
Q.3	**(a)**	Explain the dynamic behavior of DC shunt machine when sudden change in load torque is applied.	**07**
	(b)	Explain the significance of Perk's transformation in the analysis of synchronous machines	**07**
		OR	
Q.3	**(a)**	Explain starting operation of shunt connected DC machine supplied from a constant voltage source.	**07**
	(b)	Explain generalized theory of rotating electrical machine and Kron's primitive machine.	**07**
Q.4	**(a)**	Prepare time domain block diagram for DC shunt machine.	**07**
	(b)	Derive transformation matrix K_s for transforming a stationary circuit abc variable into d_s and q_s axis variables.	**07**
		OR	
Q.4	**(a)**	Explain the computer simulation of symmetrical induction machine in stationary reference frame using appropriate block diagram.	**07**
	(b)	Explain energy and co-energy. Derive relationship for them if current and displacement as variables and flux linkage and displacement as variables.	**07**
Q.5	**(a)**	Derive the torque speed characteristics of permanent magnet brushless dc machine and define common mode of operation.	**07**
	(b)	Explain the analysis of switched reluctance motor.	**07**
		OR	
Q.5	**(a)**	Derive voltage and torque equations in machine variable for permanent magnet brushless dc machine.	**07**
	(b)	Draw and explain the steady state torque speed characteristic of a singly excited induction machine. Discuss the effect of frequency on the steady state torque speed characteristic.	**07**

****