Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2014

Subject code: 1720703 **Date: 20-06-2014**

Subject Name: Power System Dynamics and Control

Time: 02:30 pm - 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 the equation of instantaneous electromagnetic torque (T_e), for a synchronous machine, in terms of ód-qô variables in rotor reference frame.	**07**
	(b)	Briefly describe Parkôs transformation and explain its importance in power system analysis.	**07**
Q.2	**(a)**	Mention the basic assumptions and derive the equation of terminal voltage of a smooth cylindrical rotor alternator, in sinusoidal steady state condition.	**07**
	(b)	Derive the relation between the óD-Q-0ô parameters in synchronous reference frame and ód-q-0ô parameters in rotor reference frame for a synchronous machine.	**07**
		OR	
	(b)	Explain the difference between steady state analysis and transient analysis. Give suitable examples and briefly explain each one of them.	**07**
Q.3	**(a)**	Draw the equivalent circuit of a synchronous machine and derive the equation of its instantaneous power output.	**07**
	(b)	Draw and explain the phasor diagrams for smooth cylindrical and salient pole alternators in sinusoidal steady state condition.	**07**
		OR	
Q.3	**(a)**	State and explain the conditions for synchronizing an alternator with infinite bus. Assume constant field excitation and fixed mechanical power input.	**07**
	(b)	Explain the effect of change in excitation as well as change in mechanical power input for an alternator connected to infinite bus.	**07**
Q.4	**(a)**	Mention different types of excitation systems. Draw and explain the block diagram of any one of them.	**07**
	(b)	Write a short note on transmission line model used for dynamic analysis of power system.	**07**
		OR	
Q.4	**(a)**	Explain the speed governing system for hydro turbine with necessary schematic diagram.	**07**
	(b)	Draw block diagram of SVC controller and explain the control characteristic of SVC.	**07**
Q.5	**(a)**	List the types of load model used in power system analysis. Also mention appropriate application for each one of them	**07**
	(b)	Write a short note on Hopf bifurcation.	**07**
		OR	
Q.5	**(a)**	State the common assumptions in dynamic analysis of a multi machine system. Develop a simplified system model for the same.	**07**
	(b)	What do you mean by small signal analysis of a system? How it is better compared to simulation of a system?	**07**