Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

ME Semester –II Examination Dec. - 2011

Subject code: 1720703 **Date: 14/12/2011**

Subject Name: Power System Dynamics & Control (Power Group)

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)**	State basic assumptions made in steady state analysis of an alternator and derive open circuit voltage equation of it.	**07**
	(b)	Draw the functional block diagram of a typical excitation control system and explain function of each block.	**07**
Q.2	**(a)**	Explain line modeling by D-Q transformation using α-β variables.	**07**
	(b)	Using Park transformation derive voltage equation of synchronous machine. Also state importance of Park transformation.	**07**
		OR	
	(b)	Prove that, if the armature flux linkages components, with respect to a synchronously rotating reference frame are constants, then the transformer emf terms and terms introduced by the variations in rotor speed cancel each other.	**07**
Q.3	**(a)**	Draw and explain speed-governing system and model of speed-governing system for steam turbines.	**08**
	(b)	Write short-note on Hopf Bifurcation.	**06**
		OR	
Q.3	**(a)**	State the types of SVCs. Explain FC-TCR by neat sketch. Also draw block diagram of SVC Controller.	**08**
	(b)	Derive steady state equation of transmission line using phasor notation f=fQ+ jfD, Draw phasor diagram showing relationship between DQ and dq variables.	**06**
Q.4	**(a)**	Classify load models. Explain static load representation in details.	**07**
	(b)	Explain potential source controlled rectifier exciter system with diagram.	**07**
		OR	
Q.4	**(a)**	Explain energy conversion in electromechanical system.	**07**
	(b)	Develop dynamic model of synchronous machine with field circuit and two equivalent damper windings on q-axis (Model 2.2). Develop stator equations and draw its equivalent circuit.	**07**
Q.5	**(a)**	A single machine system connected with infinite bus through resistance R_e and reactance X_e. Derive expression for ΔV_d and ΔV_q using machine model 1.0 and neglecting armature resistance.	**08**
	(b)	Using rotor mechanical equations of synchronous machine obtain Torque-angle loop.	**06**
		OR	
Q.5	**(a)**	State assumption made in Multi machine system and develop simplified system model for the same.	**08**
	(b)	Draw overall block diagram of SMIB consisting the rotor swing equations, flux decay and excitation system. Neglect the damping term(D) in the swing equations for convenience.	**06**

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