Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2022

Subject Code:3170915 Date:07-01-2023

Subject Name:Power System Dynamics and Control

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.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	What is the main purpose of the power system dynamics study?	**03**
	(b)	Differentiate between steady state and transient stability of power system network.	**04**
	(c)	Derive the swing equation of a single generator connected to infinite bus in per unit form.	**07**
Q.2	**(a)**	Draw the schematic diagram of a three phase synchronous generator.	**03**
	(b)	Explain polynomial representation of static load.	**04**
	(c)	A generator is connected to an infinite bus through an external impedance of jXe. The generator is represented by a voltage source Eg∠δ in series with a reactance Xg. If Eg=Eb (infinite bus voltage)=1.0, Xe = -0.5, Xg = 0.3 (all in p.u), for Pb =1.0 p.u, find the equilibrium value of δ, in the range of (-π, π). Test their stability (Pb is the received power at the infinite bus). Assume infinite bus angle as zero.	**07**
		OR	
	(c)	Explain general model for speed governor for steam turbine using neat block diagram.	**07**
Q.3	**(a)**	What is the basic function of power system stabilizer?	**03**
	(b)	Write the assumptions made in classical model of the synchronous generator in steady state stability analysis.	**04**
	(c)	With the help of a neat block diagram, explain different operating states of a typical power system network.	**07**
		OR	
Q.3	**(a)**	What are the assumptions made in derivation of the basic equation of a synchronous machine?	**03**
	(b)	Express the stator voltage equation in dq-axis.	**04**
	(c)	Briefly describe Park's transformation and explain its importance in power system modeling and analysis.	**07**
Q.4	**(a)**	What are the types of excitation systems?	**03**
	(b)	Explain power invariant form of park's transformation.	**04**
	(c)	Draw general functional block diagram of an excitation control system and explain the function of each block.	**07**

OR

Q.4	**(a)**	What are the basic functions of excitation system?	**03**
	(b)	List various models of synchronous machine based on the windings used in dq-axis.	**04**
	(c)	Explain transmission line modeling by D-Q transformation using α-β variables.	**07**
Q.5	**(a)**	Write the advantages of using per unit system for modelling of synchronous machine.	**03**
	(b)	Explain modelling of transmission network using π equivalent circuit.	**04**
	(c)	Explain the equal area criterion for single machine infinite bus system with the help of power angle curves. State the assumptions used in applying equal area criterion.	**07**

OR

Q.5	**(a)**	Discuss with reasons: Load are modelled as constant impedance in stability studies.	**03**
	(b)	Briefly discuss short circuit tests of synchronous machine.	**04**
	(c)	Explain the steps for calculating initial conditions of a synchronous generator with phasor diagram.	**07**