GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VII (NEW) EXAMINATION – SUMMER 2024

Subject Code:3170915   **Date:30-05-2024**

Subject Name:Power System Dynamics and Control

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

			Marks
Q.1	**(a)**	What do you mean by power system dynamics? State the advantages of power system dynamic analysis.	**03**
	(b)	Discuss the role of Damper winding in synchronous generators' performance analysis.	**04**
	(c)	Draw and explain the equivalent circuit of a salient pole synchronous generator. Also, explain various time constants of the equivalent circuit.	**07**
Q.2	**(a)**	Give the classification of power system stability studies and briefly explain the voltage stability analysis.	**03**
	(b)	Explain the necessary assumptions made in the classical model of the synchronous generator for steady-state stability analysis.	**04**
	(c)	Analyze the power system steady-state stability and discuss the concept of eigenvalue.	**07**
		OR	
	(c)	With the help of a neat and clean block diagram, explain the different operating states of a typical power system network.	**07**
Q.3	**(a)**	What is Park's transformation? Discuss the advantages of this transformation.	**03**
	(b)	Define transient stability and explain the need for transient stability analysis of a power system network.	**04**
	(c)	Define per unit system and obtain the per unit values of a power system network components from their rated values.	**07**
		OR	
Q.3	**(a)**	Why the excitation system is required? Give the classification of excitation systems.	**03**
	(b)	Analyze the synchronizing and damping torque without an automatic voltage regulator (AVR).	**04**
	(c)	Draw a general functional block diagram of an excitation control system and explain the function of each block.	**07**
Q.4	**(a)**	Enlist and differentiate the generator models suggested by the IEEE Task Force report published in 1986.	**03**
	(b)	What are the various data required for synchronous machines? Discuss the tests performed on synchronous machines to obtain such data.	**04**
	(c)	Discuss in detail the application of synchronous generator Model 1.1 as suggested by the IEEE Task Force.	**07**
		OR	

Q.4 **(a)** What is the compensation of a transmission line? Which compensation (series or shunt) is suitable for a transmission line? Justify your answer. **03**

(b) List the methods of static VAR compensations (SVCs). Explain to anyone in detail. **04**

(c) Discuss in detail the control characteristic of SVC. **07**

Q.5 **(a)** What is a Power System Stabilizer (PSS)? Discuss the need for using PSS for dynamic studies. **03**

(b) Discuss in detail the use of HVDC links and static VAR controllers (SVCs) for power system stabilization. **04**

(c) Explain transmission line modelling by D-Q transformation using α-β variables. **07**

OR

Q.5 **(a)** Why load is considered as a constant impedance model? **03**

(b) Explain polynomial and exponential representation of static load. **04**

(c) Explain in detail any two sub-synchronous resonance (SSR) mitigation techniques. **07**

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