K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:I
Class:PG-I	Program:M.Tech
Branch Code:ELE	Pattern:2024
Name of Course:Power System Dynamics	Course Code:2406502
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 2 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

		Marks	CO
Question No. 1			
1a)	A synchronous generator having an internal emf (E) of 1.10 pu is connected to an infinite bus having a voltage (V) set at 1.00 pu through a reactance of 0.8 pu. Due to sudden disturbance the mechanical input is suddenly increased from 0.8 pu to 1.10 pu. With the help of a well labelled diagram of the equal-area criterion, determine whether the machine will remain synchronized (transiently stable) after this system disturbance.	(6)	CO1
Question No. 2			
2a)	Derive the voltage equations in the d-q reference frame and discuss their significance in analyzing the dynamic behavior of the synchronous machine.	(6)	CO2
Question No. 3			
3a)	Derive the state equation of the small signal analysis of a single machine system.	(8)	CO3
	OR		
3b)	Derive the characteristic equation of the small signal analysis of a single machine system.	(8)	CO3
3c)	Derive the stability condition of a single machine system fast excitation system.	(8)	CO3
	OR		
3d)	With the help of a block diagram, explain the mathematical modelling of the Torque-angle loop for a single machine system.	(8)	CO3
Question No. 4			
4a)	What is a Power System Stabilizer, and how does it function within a power system? Provide a detailed explanation.	(8)	CO4
	OR		
4b)	What is low frequency oscillation? What are the major factors that contribute to this instability in the power system?	(8)	CO4
4c)	With the help of a well labelled diagram, explain the structure of the power system stabilizer circuit.	(8)	CO4

OR

4d)	With the help of a well labelled diagram, explain the following terms related to power system stabilizer: • Dynamic compensator, • Torsional filter	(8)	CO4

Question No. 5

5a)	Explain the term voltage instability. Discuss the conditions that lead to voltage instability.	(8)	CO1, CO3

OR

5b)	In context to voltage stability, explain the following terms: • Small disturbance voltage stability • Transient voltage stability • Long-term voltage stability • Power uncontrollability	(8)	CO1, CO3
5c)	Compare angle stability with voltage stability, highlighting their relationship and areas of overlap.	(8)	CO1, CO3

OR

5d)	Explain how reactive power compensation, FACTS devices, and load management helps in maintaining voltage stability.	(8)	CO1, CO3

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