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:VII
Class:FINAL (B. Tech)	Program:B.Tech Chemical Engg.
Branch Code:CHE	Pattern:2022
Name of Course: Process Dynamics and Control	Course Code:CHE224002
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 of the Question/sub-question.

		Marks	CO
Question No. 1			
1a)	A thermometer showing steady state temperature of 20^{o}C is suddenly immersed into a hot bath at 80^{o}C. If time constant of thermometer is 5 sec, determine the following. i) Thermometer reading after 5 sec. ii) Time required for 75 % response.	(6)	CO2
Question No. 2			
2a)	Explain P, PI, PD and PID controller with its applications	(6)	CO1
Question No. 3			
3a)	Apply the Routh–Hurwitz stability criterion to test the stability of a system having the characteristic equation $S^4+3S^3+5S^2+4S+2=0$. Predict the number of roots lying in the positive and negative half-planes.	(8)	CO4
	OR		
3b)	Apply the Routh–Hurwitz stability criterion and determine range of K for stable system having characteristics equation $S^3+KS^2+6S+5 = 0$. Also determine roots on the imaginary axis.	(8)	CO2, CO4
3c)	Draw root locus diagram and evaluate stability of control system for given open loop transfer function: $GH = \frac{K}{s(s+2)(s+4)}$	(8)	CO2, CO4
	OR		
3d)	Draw root locus diagram and evaluate stability of control system for given open loop transfer function:	(8)	CO2, CO4

$$GH = \frac{K(4s+1)}{(s+1)(2s+1)}$$

Question No. 4

4a)	Derive response equation for sinusoidal input to first order system.	(8)	CO1, CO2

OR

4b)	Draw the Bode diagram for PD controller. Analyze how the system's gain and phase response change with variation in frequency.	(8)	CO2
4c)	Draw the Bode diagram for PI controller. Analyze how the system's gain and phase response change with variation in frequency.	(8)	CO2, CO4

OR

4d)	Explain Bode stability criterion. Predict on gain margin and phase margin for stable system.	(8)	CO2, CO4

Question No. 5

5a)	Differentiate Between Feedforward and Feedback system.	(8)	CO1, CO3

OR

5b)	Explain Application of Ratio, and cascade control system	(8)	CO3
5c)	Explain Inferential control system with neat diagram.	(8)	CO3

OR

5d)	Explain DCS control System with neat diagram.	(8)	CO3

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