



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:IV
Class:SY	Program:B.Tech
Branch Code:ETC	Pattern:2023
Name of Course:Foundations of Cyber Physical Systems	Course Code:2302216(A)
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 pages.
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) **How do cyber-physical systems contribute to smart infrastructure development?** (6) CO1

Question No. 2

- 2a) **1) For the system $dx/dt = Ax$, where $A = \begin{bmatrix} 0 & 1 \\ -4 & -3 \end{bmatrix}$, determine the stability by analyzing the eigenvalues of A.** (6) CO2

2) Compare the stability of a system with poles at -1 and -2 versus a system with poles at 1 and -2 using root locus analysis.

Question No. 3

- 3a) **Write a short note on Hybrid Automata for CPS Modeling** (8) CO3

OR

- 3b) **Write a short note on Lyapunov Stability Theory in CPS** (8) CO3

- 3c) **Write down Applications of Advanced Analysis Techniques in CPS** (8) CO3

OR

- 3d) **Explain Barrier Functions for Safety Assurance** (8) CO3

Question No. 4

- 4a) **What does NN in CPS stand for? Explain** (8) C04

OR

- 4b) **What is the main goal of a controller in a cyber-physical system? Give one example of a system that needs a safe controller in detail** (8) C04

- 4c) **What is the role of a neural network in a controller?** (8) C04

OR

- 4d) **What is the difference between a safe and unsafe controller? Give its example** (8) C04

Question No. 5

5a) **Why is security important in CPS?** (8) CO5

OR

5b) **What is the main purpose of a Kalman Filter?** (8) CO5

5c) **What is a cyber-attack in the context of CPS?** (8) CO5

OR

5d) **What is the difference between detection and mitigation in CPS?** (8) CO5

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