



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:V
Class:TY	Program:B.Tech
Branch Code:ETC	Pattern:2022
Name of Course:Foundation Course in ML	Course Code:ETC223006(D)
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) Write a basic algorithm for training and testing a model in ML (6) 1

Question No. 2

- 2a) Explain functions for handling missing values in a dataset with any one suitable Python example. (6) 2

Question No. 3

- 3a) Discuss Vector Quantization. Explain the role of codebooks, codeword assignment, distortion measure, and applications in signal and image compression. (8) 3

OR

- 3b) Explain the Self-Organising Feature Map (SOM) algorithm. Describe its structure, competitive learning rule, neighbourhood function, training phases, and applications. (8) 3

- 3c) Compare supervised learning with unsupervised learning. Using Decision Trees and K-Means, explain how the learning process differs in structure, objective, and outcome (8) 3

OR

- 3d) Discuss the role of basic statistics in probabilistic learning models. Explain mean, variance, covariance, correlation, standard deviation, and probability distributions with relevance to ML models. (8) 3

Question No. 4

- 4a) Using GA for Optimization: Explain how Genetic Algorithms solve optimization problems. Provide a Python example to optimize a mathematical function using a simple GA implementation. (8) 4

OR

- 4b) Discuss Reinforcement Learning (RL). Explain the concepts of agent, environment, policy, reward, exploration vs exploitation, with a real-world example (8) 4
- 4c) Explain the components of a Markov Decision Process (MDP): states, actions, transition probabilities, rewards, policy, and discount factor. Provide an example illustrating state transitions. (8) 4

OR

- 4d) Describe the “Getting Lost” example in Reinforcement Learning. Explain how an agent learns optimal actions using rewards and penalties. Provide Python code for a simple grid-world RL simulation. (8) 4

Question No. 5

- 5a) Explain Hidden Markov Models (HMM). Discuss its components (states, transition probabilities, emission probabilities) and algorithms (Forward, Viterbi). (8) 5

OR

- 5b) Discuss the Viterbi algorithm for HMM decoding. Derive the recurrence relation and explain how it finds the most probable hidden state sequence. (8) 5

- 5c) Describe Tracking Methods in computer vision. Compare Kalman Filter, Particle Filter, and Optical Flow for motion tracking applications. (8) 5

OR

- 5d) Explain how MCMC is used in Particle Filters for object tracking. Describe resampling, weight updates, and convergence behavior. (8) 5

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