

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET University)

B. Tech (Fourth Semester - Regular) Examinations, April 2026
23BCSES24003- Introduction to Machine Learning
(Chemical and Mechanical)



Time: 3 hrs

Maximum: 60 Marks

(The figures in the right hand margin indicate marks)

PART – A

(2 x 5 = 10 Marks)

- Q.1. Answer ALL questions
- | | CO # | Blooms Level |
|---|------|--------------|
| a. Differentiate between Regression and Classification with one example each where confusion may arise. | CO1 | K3 |
| b. Explain Reinforcement Learning and its applications. | CO5 | K2 |
| c. What is K-Nearest Neighbors (K-NN) classification? Discuss the role of the parameter K in the K-NN algorithm. | CO4 | K2 |
| d. Explain how a Decision Tree works in classification problems with an example. | CO4 | K2 |
| e. Explain the role of data visualization techniques such as Box Plot and Scatter Plot. | CO2 | K2 |

PART – B

(10 x 5 = 50 Marks)

- Answer ALL the questions
- | | Marks | CO # | Blooms Level | | | | | | | | | | | | |
|---|----------------|--------|--------------|--------|--------|--------|-----------|---|----|----|----|----|--|--|--|
| 2. a. Explain supervised learning with detailed examples of regression and classification problems. How does the choice of labeled data impact model performance? provide examples | 5 | CO1 | K3 | | | | | | | | | | | | |
| b. Describe the complete Machine Learning workflow starting from data collection to model deployment. Critically evaluate which stage is most crucial and justify your answer. | 5 | CO1 | K2 | | | | | | | | | | | | |
| (OR) | | | | | | | | | | | | | | | |
| c. Differentiate between Supervised and Unsupervised Learning, and apply these concepts to suitable real-world scenarios. | 5 | CO1 | K3 | | | | | | | | | | | | |
| d. Explain the concepts of bias, variance, and the bias–variance trade-off in Machine Learning with suitable diagrams and examples. | 5 | CO2 | K2 | | | | | | | | | | | | |
| 3.a. Calculate Variance and Standard Deviation for the following ungrouped dataset: {5, 3, 2, 5, 1, 4, 7, 9, 5, 8} | 5 | CO2 | K3 | | | | | | | | | | | | |
| b. Explain the concept of Data Reduction in data pre-processing. Describe various techniques used for data reduction and demonstrate how you would apply these techniques to handle a large dataset efficiently while preserving important information. | 5 | CO2 | K3 | | | | | | | | | | | | |
| (OR) | | | | | | | | | | | | | | | |
| c. Find Mean, Median, Mode for the following grouped data: | 5 | CO2 | K3 | | | | | | | | | | | | |
| <table><tr><td>Class Interval</td><td>10- 20</td><td>20- 30</td><td>30- 40</td><td>40- 50</td><td>50- 60</td></tr><tr><td>Frequency</td><td>5</td><td>12</td><td>25</td><td>18</td><td>16</td></tr></table> | Class Interval | 10- 20 | 20- 30 | 30- 40 | 40- 50 | 50- 60 | Frequency | 5 | 12 | 25 | 18 | 16 | | | |
| Class Interval | 10- 20 | 20- 30 | 30- 40 | 40- 50 | 50- 60 | | | | | | | | | | |
| Frequency | 5 | 12 | 25 | 18 | 16 | | | | | | | | | | |
| d. Given the dataset: 200, 300, 500, 800, 900, 1000
Apply Min-Max Normalization and Z- score Normalization to scale the values within the range of 0 to 1. | 5 | CO2 | K3 | | | | | | | | | | | | |
| 4.a. A dataset represents the relationship between study hours (X) and marks obtained (Y) by students: Study Hours (X)= {1, 2, 3, 4} and Marks (Y)= {2, 4, 5, 7}
Perform the following tasks: | 5 | CO3 | K3 | | | | | | | | | | | | |
| a. Determine the linear regression equation of the form $Y = a + bX$ using the least squares method. | | | | | | | | | | | | | | | |
| b. Use the derived equation to predict the marks when study hours = 5. | | | | | | | | | | | | | | | |
| c. Calculate the MSE and MAE between actual and predicted values. | | | | | | | | | | | | | | | |
| d. Interpret whether the model fits the data well based on the error value. | | | | | | | | | | | | | | | |
| b. The following data points shows actual and predicted values:
Actual values: [3, 5, 8, 12, 15] and Predicted values: [4, 4, 9, 11, 16] | 5 | CO3 | K3 | | | | | | | | | | | | |
| a. Compute MAE, MSE, RMSE and R^2 . | | | | | | | | | | | | | | | |
| b. Analyze how well the model explains the variance in the data. | | | | | | | | | | | | | | | |
| (OR) | | | | | | | | | | | | | | | |
| c. A dataset contains two independent variables representing internal marks (X1) and attendance (X2) and the dependent variable representing final marks (Y):
Perform the following: | 5 | CO3 | K3 | | | | | | | | | | | | |

- | | | | |
|-----------|---|---|---|
| X1 | 1 | 2 | 3 |
| X2 | 2 | 1 | 4 |
| Y | 5 | 6 | 9 |

- | | | |
|---|-----|----|
| 5 | CO3 | K3 |
| 5 | CO4 | K4 |

- 5 C04 K3

- ### Tasks:

- | Outlook | Humidity | Play |
|---------|----------|------|
| Sunny | High | No |
| Sunny | Normal | Yes |
| Rainy | High | Yes |
| Rainy | Normal | Yes |

X	Y
0	0
2	0
4	1

- 5 CO4 K4

- 5 CO4 K3

- | Data Points | P1 | P2 | P3 | P4 | P5 |
|-------------|----|----|----|----|----|
| X | 2 | 3 | 8 | 7 | 6 |
| Y | 3 | 3 | 7 | 8 | 7 |

- 5 C05 K3

- 5 C05 K4

7 CO5 K4

- | Transaction ID | Items Purchased |
|----------------|---------------------------|
| T1 | Milk, Bread, Butter |
| T2 | Bread, Eggs, Cheese |
| T3 | Milk, Bread, Eggs |
| T4 | Milk, Butter, Cheese |
| T5 | Bread, Butter, Eggs |
| T6 | Milk, Bread, Butter, Eggs |

- 3 C05 K3

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