# PRESIDENCY UNIVERSITY

## BENGALURU

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### End - Term Examinations –MAY 2025

**Date:** 30-05-2025                                    **Time:** 01.00 pm – 04:00 pm

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| **School:** SOCSE | **Program:** B. Tech in Computer Science & Engineering (General & Allied ) |
|---|---|
| **Course Code :** CSE3157 | **Course Name:** Artificial Intelligence and Machine Learning |
| **Semester**: IV | **Max Marks**: 100     **Weightage**: 50% |

| CO - Levels | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| Marks | | | | | |

**Instructions:**

    *(i)  Read all questions carefully and answer accordingly.*

    *(ii) Do not write anything on the question paper other than roll number.*

### Part A

**Answer ALL the Questions. Each question carries 2marks.**                    **10Q x 2M=20M**

| 1. | Recall PEAS description of the task environment for an agent used in driverless taxi. | 2 Marks | L1 | CO1 |
|---|---|---|---|---|
| 2. | State Turing test for an AI agent. | 2 Marks | L1 | CO1 |
| 3. | Recall with a sketch local maximum and global maximum in Hill Climbing algorithm. | 2 Marks | L1 | CO2 |
| 4. | Describe Object-attribute-value for a ball. | 2 Marks | L1 | CO2 |
| 5. | Write the formula for Gini Index at a node indicating what each term means. | 2 Marks | L1 | CO3 |
| 6. | Describe class imbalance problem in classification with a numerical example and the relevance of measures, precision and recall. | 2 Marks | L1 | CO3 |
| 7. | State accuracy and confusion matrix? | 2 Marks | L1 | CO3 |
| 8. | In K-means clustering how do you calculate cluster centroid? | 2 Marks | L1 | CO4 |

| 9. | Draw the perceptron and show the equations involved in getting output from 3 input. Assume sigmoid activation function. | 2 Marks | L1 | CO4 |
|---|---|---|---|---|
| 10. | With sketch review sigmoid and tanh activation functions | 2 Marks | L1 | CO4 |

## Part B

### Answer the Questions.          Total Marks 80M

| 11. | | Sketch the goal-based agent block diagram and explain how goal plays the role in reacting to percepts with suitable examples. | 10 Marks | L2 | CO1 |
|---|---|---|---|---|---|
| | | **Or** | | | |
| 12. | | Summarize knowledge-based system to diagnose diseases. Provide a neat sketch. | 10 Marks | L2 | CO1 |

| 13. | | Explain with examples the key differences between supervised and unsupervised Learning. Discuss any one real-world scenario for all the methods. | 10 Marks | L2 | CO3 |
|---|---|---|---|---|---|
| | | **Or** | | | |
| 14. | | Compare MAE, MSE, RMSE, and R-squared as evaluation metrics for regression models. | 10 Marks | L2 | CO3 |

| 15. | | In a decision tree a node has class distribution as Class1=7, Class2=5. This node is split into two children as N1 and N2. Distribution of two classes in N1 and N2 are Class1=5, Class2=1 and Class1=4, and Class2=2 respectively. Calculate the GINI index of parent and children and the gain achieved with split. | 10 Marks | L3 | CO3 |
|---|---|---|---|---|---|
| | | **Or** | | | |
| 16. | | Write the expression of Entropy in connection with decision tree. Calculate entropy of the node if the two classes Class1 and Class2 distribution is a)C1:0 C2:6, b)C1: 1C2:5 c)C1:2 C2:4 | 10 Marks | L3 | CO3 |

| 17. | | It's hokey . There are virtually no surprises , and the writing is second-rate .      So why was it so enjoyable ? For one thing , the cast is great . Another nice touch is the music . I was overcome with the urge to get off the couch and start dancing . It sucked me in , and it'll do the same to you<br><br>For the above paragraph the following features are extracted for sentiment analysis problem (+ve and -ve sentiments only)<br>X1 = Count of positive words = 3<br>X2 = Count of negative words = 2<br>X3 = 1 (if "no" is there in document, else 0) = 1<br>X4 = Count of 1st and 2nd person pronouns = 3<br>X5 = 1 if "!" is present in the document, else 0 = 0<br>X6 = ln(word count of document) = 4.19 | 15 Marks | L3 | CO4 |
|---|---|---|---|---|---|

| | | Suppose you want to apply logistic regression and the following weights are given w = [2.5, -5, -1.2, 0.5, 2, 0.7], and b = 1. Calculate the positive and negative sentiments P(+\|x) = P(y=1\|x) and P(-\|x) = P(y=0\|x) aka positive and negative sentiments. Assume a sigmoid activation function. | | | |
|---|---|---|---|---|---|
| | | **Or** | | | |
| **18.** | | Use K means Clustering algorithm to divide the following data into two clusters. Co-ordinates are given. | **15 Marks** | **L3** | **CO4** |

For question 18, the embedded table:

| X | 1 | 2 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Y | 1 | 1 | 3 | 2 | 3 | 5 |

Choose V1=(2,1) V2=(2,3) as initial centroid.

| | | | | | |
|---|---|---|---|---|---|
| **19.** | | Write python program to implement Logistic Regression using scikit-learn, and to evaluate its performance on a dataset. Assume your own dataset. | **15 Marks** | **L3** | **CO3** |
| | | **Or** | | | |
| **20.** | | Write python code to implement Decision Tree using scikit-learn, and to evaluate its performance on a dataset. Assume our own dataset. | **15 Marks** | **L3** | **CO3** |

| | | | | | |
|---|---|---|---|---|---|
| **21.** | | Write Python program to implement the K-Means clustering algorithm for a given dataset Your solution should include the following: <br><br> 1. Load and preprocess the dataset (e.g., handle missing values, normalize features if necessary). <br> 2. Implement the K-Means algorithm using a library such as scikit-learn or manually if specified. <br> 3. Print Cluster Centres <br> 4. Visualize the clusters using a 2D or 3D plot for the given dataset. <br> 5. Find the optimum number of clusters: Using Elbow method. <br><br> Assume our own dataset( average income and age). | **20 Marks** | **L3** | **CO4** |
| | | **Or** | | | |
| **22.** | | Write python program to implement a three layer neural network for binary classification using Keras. Assume your own data set. Assume number of neurons in each layer and appropriate activation function. | **20 Marks** | **L3** | **CO4** |