Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

Mid - Term Examinations – October 2025

Date: 07-10-2025 **Time:** 09.30am to 11.00am

School: SOE	**Program:** B.Tech	
Course Code : ECE3020	**Course Name:** Computational Intelligence and Machine Learning	
Semester: V	**Max Marks**: 50	**Weightage**: 25%

CO - Levels	CO1	CO2	CO3	CO4	CO5	CO6
Marks	24	26	0	0	0	0

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. **5Q x 2M=10M**

1	Overfitting is an undesirable machine learning behavior. What is overfitting in machine learning and mention 1 point to avoid it.	**2 Marks**	**L1**	**CO1**
2	In supervised machine learning, we use different techniques for classification and regression. Differentiate between decision tree and random forest in classification with proper diagram.	**2 Marks**	**L2**	**CO2**
3	In machine learning different error metrices are used for evaluating performance of the model. Define **MAE, MSE, or RMSE.**	**2 Marks**	**L1**	**CO2**
4	There are different types of machine learning. Differentiate between Unsupervised and reinforcement learning. Give one example of each.	**2 Marks**	**L2**	**CO1**
5	R-squared is a statistical measure used in machine learning. Define R-square? Why is it important in evaluating classification models?	**2 Marks**	**L2**	**CO2**

Part B

Answer the Questions. **Total Marks 40M**

<table>
<tr><td>6.</td><td>a.</td><td>A college professor believes that if the grade for internal examination is high in a class, the grade for external examination will also be high. A random sample of 6 students in that class was selected, and the data is given below:

<table><tr><th>Student</th><th>Internal exam marks</th><th>External exam marks</th></tr><tr><td>1</td><td>30</td><td>45</td></tr><tr><td>2</td><td>20</td><td>25</td></tr><tr><td>3</td><td>30</td><td>31</td></tr><tr><td>4</td><td>27</td><td>29</td></tr><tr><td>5</td><td>35</td><td>38</td></tr><tr><td>6</td><td>15</td><td>17</td></tr></table>
Derive a linear regression equation to model the above data.</td><td>10 Marks</td><td>L3</td><td>CO 1</td></tr>
<tr><td colspan="5">Or</td></tr>
<tr><td>7.</td><td>a.</td><td>A confusion matrix is a table that summarizes the performance of a machine learning classification model, showing the counts of correctly and incorrectly classified instances across different classes. A person predicts the winning or losing chances of a particular team in IPL out of 100 matches played. Here are the results given as a Confusion Matrix:

<table><tr><td></td><td>ACTUAL win</td><td>ACTUAL loss</td><td>Total</td></tr><tr><td>PREDICTED win</td><td>60</td><td>20</td><td>80</td></tr><tr><td>PREDICTED loss</td><td>15</td><td>5</td><td>20</td></tr><tr><td>Total</td><td>75</td><td>25</td><td>100</td></tr></table>
Calculate the Accuracy, Precision, Recall (Sensitivity), Specificity and F1-Score.</td><td>10 Marks</td><td>L3</td><td>CO 2</td></tr>
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8.	**a.**	In Machine learning, R-squared is used for model performance evaluation. Calculate R-squared coefficient for a regression problem to evaluate how well a regression model predicting	**10 Marks**	**L3**	**CO1**

		house prices (in thousands) **House** | **Actual Price** | **Predicted Price** **1** | **230** | **245** **2** | **180** | **200** **3** | **300** | **310** **4** | **275** | **295** **5** | **350** | **385** **6** | **150** | **170**			
		Or			
9.	**a.**	Model evaluation is the process of assessing how well a machine learning model performs on unseen data using different metrics and techniques. Explain k-fold cross-validation and its importance in model evaluation.	**10 Marks**	**L3**	**CO2**

10.	**a.**	It is important to assess how well a machine learning model performs on unseen data using different metrics and techniques. It is required to ensure that the model not only memorizes training data but also generalizes to new situations. Analyze the concepts of overfitting and underfitting in machine learning models.	**10 Marks**	**L4**	**CO 1**
		Or			
11.	**a.**	Error analysis in machine learning is the systematic process of examining and understanding the errors made by a machine learning model. Calculate the Mean Squared Error (MSE) and Mean Absolute Error (MAE) for a linear regression model predicting student scores: Student | Actual Score | Predicted Score 1 | 75 | 80 2 | 80 | 95 3 | 78 | 70 4 | 85 | 90	**10 Marks**	**L2**	**CO 2**

12.	**a.**	Classification in machine learning is a supervised learning task where an algorithm categorizes data points into discrete, predefined classes or labels. Use Random Forest algorithm to	**10 Marks**	**L3**	**CO 2**

		predict the price of a flat with 1400 square feet of carpet area, 3 bedrooms and 2 bathrooms. **Flat** | **Number of bedrooms** | **Number of bathrooms** | **Carpet area** | **Price (in $)** **1** | **5** | **4** | **2500** | **300** **2** | **4** | **2** | **1700** | **210** **3** | **2** | **1** | **850** | **125** **4** | **4** | **3** | **200** | **240** **5** | **3** | **3** | **1600** | **200** **6** | **2** | **2** | **1000** | **150**			
Or					
13.	**a.**	Machine learning (ML) is a field of artificial intelligence that teaches computers to learn from data without explicit programming, enabling them to improve performance over time by identifying patterns and making informed decisions. Compare supervised and unsupervised learning tasks. Give 5 differences.	**10 Marks**	**L1**	**CO 1**