



PRESIDENCY UNIVERSITY

BENGALURU

Roll No.													
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End - Term Examinations – May/June 2026

Date: 18-05-2026

Time: 01:00pm – 04:00pm

School: SOE	Program: B.Tech	
Course Code: ECE3020	Course Name: Computational Intelligence and Machine Learning	
Semester: VI	Max Marks: 100	Weightage: 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5
Marks	24	22	16	28	10

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.	Artificial Neural Network, a type of computing system inspired by the human brain that learns to make predictions and recognize patterns. Write short note on Artificial Neural Network (ANN)?	2 Marks	L2	CO3
2.	Machine learning is a subset of artificial intelligence (AI) where systems learn from data to identify patterns and make decisions without being explicitly programmed. What is the primary purpose of a loss function in machine learning?	2 Marks	L2	CO3
3.	Machine learning algorithms are trained on large datasets to improve their performance over time as they are exposed to more information. Write a short note on Underfitting model in the context of machine learning?	2 Marks	L2	CO3
4.	Supervised machine learning is a type of machine learning where an algorithm learns from a labeled dataset to make predictions or classifications on new, unseen data. Differentiate Linear Regression vs. Logistic Regression.	2 Marks	L2	CO4
5.	Unsupervised machine learning is a type of AI that uses algorithms to find patterns and structures in unlabeled data without any human	2 Marks	L2	CO4

	guidance. Differentiate between K-means clustering and K nearest neighbor.			
6.	Which are the different distance metrics used in KNN algorithm and comment on which one you will choose for real-life application?	2 Marks	L2	CO4
7.	What is the indication made by True Positive (TP) and False Positive (FP) in confusion matrix?	2 Marks	L2	CO1
8.	A neural network is a type of machine learning model inspired by the human brain that uses interconnected nodes, or neurons, to process data. Justify the need of activation function in neural network.	2 Marks	L2	CO1
9.	An activation function is a mathematical function in a neural network that determines a neuron's output. Differentiate between ReLu and Sigmoid activation function in neural networks.	2 Marks	L2	CO2
10.	R-squared is a statistical measure used in machine learning. Define R-square? Why is it important in evaluating classification models?	2 Marks	L2	CO4

Part B

Answer the Questions.

Total Marks 80M

11.	a.	Given data of 8 matches shown in table below, predict whether MI (Mumbai Indians) will win or lose the match using Bayes theorem if Toss = Loss, Pitch = Dry, Weather = Sunny <table><tr><th>Match</th><th>Toss</th><th>Pitch</th><th>Weather</th><th>MI Win</th></tr><tr><td>1</td><td>Win</td><td>Dry</td><td>Sunny</td><td>Yes</td></tr><tr><td>2</td><td>Loss</td><td>Wet</td><td>Rainy</td><td>No</td></tr><tr><td>3</td><td>Win</td><td>Dry</td><td>Cloudy</td><td>Yes</td></tr><tr><td>4</td><td>Loss</td><td>Wet</td><td>Sunny</td><td>No</td></tr><tr><td>5</td><td>Win</td><td>Wet</td><td>Rainy</td><td>No</td></tr><tr><td>6</td><td>Loss</td><td>Dry</td><td>Sunny</td><td>Yes</td></tr><tr><td>7</td><td>Win</td><td>Dry</td><td>Rainy</td><td>Yes</td></tr><tr><td>8</td><td>Loss</td><td>Wet</td><td>Cloudy</td><td>No</td></tr></table>	Match	Toss	Pitch	Weather	MI Win	1	Win	Dry	Sunny	Yes	2	Loss	Wet	Rainy	No	3	Win	Dry	Cloudy	Yes	4	Loss	Wet	Sunny	No	5	Win	Wet	Rainy	No	6	Loss	Dry	Sunny	Yes	7	Win	Dry	Rainy	Yes	8	Loss	Wet	Cloudy	No	10 Marks	L2	C02
Match	Toss	Pitch	Weather	MI Win																																														
1	Win	Dry	Sunny	Yes																																														
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3	Win	Dry	Cloudy	Yes																																														
4	Loss	Wet	Sunny	No																																														
5	Win	Wet	Rainy	No																																														
6	Loss	Dry	Sunny	Yes																																														
7	Win	Dry	Rainy	Yes																																														
8	Loss	Wet	Cloudy	No																																														
	b.	Clustering algorithms group data based on similarity. Explain the K-Means algorithm for clustering and discuss its applications, advantages, drawbacks.	10 Marks	L2	C03																																													
Or																																																		
12.	a.	Derive half adder circuit using ANN. Mention the respective weights and biases and draw the diagram for both sum and carry.	10 Marks	L2	C03																																													
	b.	Define activation function. Write 4 different types of activation function with their function graph and expression.	10 Marks	L2	C02																																													

13.	a.	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.	Student	Internal exam marks	External exam marks	1	30	45	2	20	25	3	30	31	4	27	29	5	35	38	6	15	17	10 Marks	L3	CO2
Student	Internal exam marks	External exam marks																								
1	30	45																								
2	20	25																								
3	30	31																								
4	27	29																								
5	35	38																								
6	15	17																								
	b.	Let's say we have 6 data points with features (x, y) and their classes: Point A: (1, 2) → Class Green Point B: (2, 1) → Class Green Point C: (1, 1) → Class Green Point D: (5, 6) → Class Orange Point E: (6, 5) → Class Orange Point F: (7, 7) → Class Orange Using k-nearest neighbors (KNN) with k=3, classify a new data point at (4, 4). Calculate the Euclidean distances to all points and determine whether it belongs to the Green or Orange class.	10 Marks	L3	CO2																					
Or																										
14.	a.	Principal Component Analysis (PCA) helps reduce data dimensionality while preserving variance. Explain the working of PCA with a suitable example. Also, differentiate between feature selection and feature extraction in PCA.	10 Marks	L3	CO3																					
	b.	Derive all 7 logic gates using ANN. Mention the respective weights and biases and draw the diagram for input- output relation.	10 Marks	L2	CO3																					

15.	a.	Artificial neural networks are inspired by biological neurons. Explain the similarities and differences between a perceptron and a biological neuron.	10 Marks	L2	C04															
	b.	The architecture of an Artificial Neural Network can be adjusted to suit specific problems. Explain how the architecture of an ANN can be changed and discuss the factors influencing these changes.	10 Marks	L2	C05															
Or																				
16.	a.	Analyze the concepts of overfitting and underfitting in machine learning models.	10 Marks	L2	C04															
	b.	The XNOR function is a classic example used to demonstrate linear separability. Explain why the XNOR function is not linearly separable and illustrate your explanation using a 2D plot.	10 Marks	L3	C05															
17.	a.	Neural networks learn by minimizing error through iterative adjustment of weights. Explain the concept and working of the Backpropagation algorithm.	10 Marks	L2	C04															
	b.	Convolutional Neural Networks (CNNs) are widely used in computer vision tasks. Explain the architecture and applications of CNNs. How can you identify that an ANN is a CNN by observing its structure?	10 Marks	L2	C04															
Or																				
18.	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: <table border="1"><thead><tr><th>Student</th><th>Actual Score</th><th>Predicted Score</th></tr></thead><tbody><tr><td>1</td><td>75</td><td>80</td></tr><tr><td>2</td><td>80</td><td>95</td></tr><tr><td>3</td><td>78</td><td>70</td></tr><tr><td>4</td><td>85</td><td>90</td></tr></tbody></table>	Student	Actual Score	Predicted Score	1	75	80	2	80	95	3	78	70	4	85	90	10 Marks	L4	C01
Student	Actual Score	Predicted Score																		
1	75	80																		
2	80	95																		
3	78	70																		
4	85	90																		
	b.	In supervised machine learning, we use different techniques for classification and regression. Differentiate between decision tree and random forest in classification with proper diagram.	10 Marks	L3	C01															