



PRESIDENCY UNIVERSITY

BENGALURU

Roll No.														
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Mid - Term Examinations - March 2026

Date: 14-03-2026

Time: 02:00pm - 03:30pm

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

CO - Levels	CO1	CO2	CO3	CO4	CO5	CO6
Marks	30	20	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	Define supervised and unsupervised learning in machine learning. Give one appropriate example to explain each learning paradigm.	2 Marks	L1	CO1
2	Distinguish between precision and recall as evaluation measures derived from a confusion matrix. Explain how each metric influences the assessment of a classification model with an example.	2 Marks	L2	CO1
3	Explain the idea of cross-validation in machine learning. Discuss the reasons for using cross-validation instead of a single train-test data split.	2 Marks	L1	CO1
4	Compare classification and regression tasks in machine learning. Support your answer with one practical application example for each type.	2 Marks	L2	CO1

5	Explain the role and components of a confusion matrix in classification problems. Describe how it is used to evaluate the performance of a classifier.	2 Marks	L2	CO1
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Part B

Answer the Questions.

Total Marks 40M

6.	a.	<p>A dataset consists of six labeled samples in a two-dimensional feature space. Using the k-Nearest Neighbors (k-NN) algorithm with $k = 3$, classify a test point located at (4, 4). Compute the Euclidean distance between the test point and each training sample, select the three closest neighbors, and assign the class label using the majority voting rule.</p> <p>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</p>	10 Marks	L3	CO2
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Or

7.	a.	<p>A binary classification model designed for email spam detection was evaluated using a dataset of 200 emails, and its results are represented using a confusion matrix. Using this matrix, compute the following performance measures: Accuracy, Precision, Recall, Specificity, and F1-Score. Explain how each metric reflects the effectiveness of the classifier.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>ACTUAL Spam</th> <th>ACTUAL Not Spam</th> <th>Total</th> </tr> </thead> <tbody> <tr> <th>PREDICTED Spam</th> <td style="text-align: center;">75</td> <td style="text-align: center;">15</td> <td style="text-align: center;">90</td> </tr> <tr> <th>PREDICTED Not Spam</th> <td style="text-align: center;">20</td> <td style="text-align: center;">90</td> <td style="text-align: center;">110</td> </tr> <tr> <th>Total</th> <td style="text-align: center;">95</td> <td style="text-align: center;">105</td> <td style="text-align: center;">200</td> </tr> </tbody> </table>		ACTUAL Spam	ACTUAL Not Spam	Total	PREDICTED Spam	75	15	90	PREDICTED Not Spam	20	90	110	Total	95	105	200	10 Marks	L3	CO2
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8.	a.	<p>A regression model predicts the selling prices of several houses. Given the actual and predicted prices for six houses, evaluate the model performance by calculating the coefficient of determination (R^2). Show all intermediate steps and interpret the obtained value in terms of goodness of fit.</p>	10 Marks	L3	CO2
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House	Actual Price	Predicted Price
1	250	245
2	180	190
3	320	310
4	275	280
5	400	385
6	150	160

Or

9.	a.	A supervised learning model based on linear regression is used to estimate student scores. Using the given actual and predicted values, compute the Mean Squared Error (MSE) and Mean Absolute Error (MAE) . Demonstrate the calculations and explain what these error measures indicate about model performance.	10 Marks	L3	CO1															
		<table border="1"> <thead> <tr> <th>Student</th> <th>Actual Score</th> <th>Predicted Score</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>85</td> <td>80</td> </tr> <tr> <td>2</td> <td>92</td> <td>95</td> </tr> <tr> <td>3</td> <td>78</td> <td>75</td> </tr> <tr> <td>4</td> <td>88</td> <td>90</td> </tr> </tbody> </table>	Student	Actual Score	Predicted Score	1	85	80	2	92	95	3	78	75	4	88	90			
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10.	a.	Examine the problems of overfitting and underfitting in machine learning. Explain how these issues arise, their effects on training and testing accuracy, and propose suitable methods to minimize each problem.	10 Marks	L4	CO1
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Or

11.	a.	Differentiate between linear regression and polynomial regression models. Compare them based on model assumptions, complexity, flexibility, and applicability to different data patterns.	10 Marks	L2	CO1
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12.	a.	Describe the Support Vector Machine (SVM) algorithm for classification. Explain the concepts of optimal hyperplane, margin, and support vectors with the help of a neat labeled	10 Marks	L3	CO1
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		diagram. Also, discuss how SVM handles linearly separable and non-linearly separable datasets.			
Or					
13.	a.	Explain the k-fold cross-validation technique used for evaluating machine learning models. Outline the steps involved and discuss how this method enhances model generalization and reduces the risk of overfitting.	10 Marks	L1	CO1