Seat No: ..... **Enrollment No: .....**

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech, Winter 2025-26 Examination

Semester: VII **Date: 13-12-2025**
Subject Code: 303105353 **Time: 10.30 am to 1.00 pm**
Subject Name: Machine Learning **Total Marks: 60**

Instructions:

1. This question paper comprises of two sections. Write answer of both the sections in separate answer books.
2. From Section A, **Q.1** is compulsory, From Section B, **Q.1** is compulsory.
3. Figures to the right indicate full marks
4. Draw neat and clean drawings & Make suitable assumptions wherever necessary.
5. Start new question on new page.
6. BT- Blooms Taxonomy Levels – Remember-1, Understand -2, Apply-3, Analyse-4, Evaluate-5, Create-6

SECTION - A

Q.1	Answer the following questions.	**Marks**	**CO**	**BT**
	A. Attempt the following questions: (a) Define the concept of an "ε-error" in PAC learning. (b) What is the significance of the δ parameter in PAC learning? (c) What is conditional probability? Provide an example.	06	CO1	BT1
	B. Attempt the following questions: (a) How does the grid search method help in hyperparameter tuning? (b) What is the purpose of using precision-recall curves in model evaluation? (c) What is the impact of outliers on machine learning models?	06	CO2	BT2
Q.2	A. Explain the significance of data collection in Machine Learning.	04	CO1	BT2
	B. How does SVM handle non-linearly separable data?	05	CO3	BT2
	OR			
	B. What is the role of the decision boundary in logistic regression?	05	CO4	BT5
Q.3	A. Describe a scenario where K-Means would produce poor clustering results due to non-spherical cluster shapes. What type of clustering algorithm might be more suitable in such cases?	04	CO4	BT4
	B. Why is linear classification not suitable for all types of data?	05	CO4	BT5
	OR			
	B. How does entropy influence the splitting of nodes in a Decision Tree?	05	CO2, CO3	BT1

SECTION - B

Q.1	Answer the following questions.	**Marks**	**CO**	**BT**
	A. Attempt the following questions: (a) What do error bounds represent in model uncertainty measurement?	06	CO3, CO4	BT2

	(b) How can confidence intervals be used to define error bounds in predictions? (c) Why are smaller error bounds preferred in a Machine Learning model?			
	B. Attempt the following questions: (a) What is Multi-Label Classification in Machine Learning? (b) How does Multi-Label Classification differ from Multi-Class Classification? (c) Give one real-world application of Multi-Label Classification.	06	CO4	BT3
Q.2	A. What does "distance" mean in hierarchical clustering?	04	CO2	BT2
	B. What are the steps involved in setting up a Machine Learning environment?	05	CO1	BT1
	OR			
	B. How do Boosting algorithms address class imbalance and improve the handling of misclassified examples?	05	CO1	BT2
Q.3	A. What is the difference between a flat and a hierarchical clustering method?	04	CO2	BT1
	B. What is Log Loss, and why is it valuable in classification tasks?	05	CO1	BT2
	OR			
	B. What does the Perceptron Convergence Theorem state, and what does it imply for training?	05	CO1	BT2