



# PRESIDENCY UNIVERSITY

BENGALURU

Roll No.														
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## Mid - Term Examinations - MARCH 2026

Date: 10-03-2026

Time: 09:30am - 11:00am

<b>School:</b> SOCSE	<b>Program:</b> B.Tech Information Science & Technology	
<b>Course Code:</b> IST2501	<b>Course Name:</b> Optimization methods for Machine learning	
<b>Semester:</b> VI	<b>Max Marks:</b> 50	<b>Weightage:</b> 25%

CO - Levels	C01	C02	C03	C04
Marks	26	24		

### 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	Explain the concept of "Empirical Risk" and provide its mathematical notation.	2 Marks	L2	C01
2	Outline any four stages of the 8-step Machine Learning Paradigm.	2 Marks	L2	C01
3	Contrast the primary goal of Structural Risk Minimization (SRM) against ERM.	2 Marks	L2	C01
4	Differentiate between standard PCA and Sparse PCA regarding model interpretability.	2 Marks	L2	C02
5	Describe the role of Cross-Entropy as a loss function in classification.	2 Marks	L2	C02

## Part B

### Answer the Questions.

Total Marks 40M

6.	a.	Distinguish between Empirical Risk Minimization (ERM) and Structural Risk Minimization (SRM) based on how they handle model complexity. Define the term "Hypothesis Space" in learning theory.	10 Marks	L2	CO1
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Or

7.	a.	Summarize the "Curse of Dimensionality" and how Low Dimensional Embedding (LDE) addresses high-dimensional data challenges. List two real-world scenarios where Dimensionality Reduction is essential.	10 Marks	L2	CO1
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8.	a.	Elaborate on the Machine Learning Paradigm by describing the 8-step workflow from data representation to final evaluation.	10 Marks	L2	CO1
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Or

9.	a.	Discuss the importance of VC-Dimension in establishing mathematical learning guarantees for a classifier.	10 Marks	L2	CO1
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10.	a.	Interpret the mechanism of Support Vector Machines (SVM) and the function of the "Kernel Trick" for non-linear data separation.	10 Marks	L2	CO2
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Or

11.	a.	Explain the mathematical relationship between Entropy and Cross-Entropy Loss in Logistic Regression.	10 Marks	L2	CO2
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12.	a.	Describe the significance of Low Rank Matrix Factorization and its utility in building recommendation engines.	10 Marks	L2	CO2
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Or

13.	a.	Contrast "Sparse Regression" with standard linear regression techniques in the context of feature selection.	10 Marks	L2	CO2
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