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Bengaluru

Mid Term Examinations - October 2026

Date: 05/10/2026 **Time:** 11:45 AM - 01:15 PM

Course Code: CSE3502 **Course Name:** Computational Optimization for Intelligent Systems

Semester: Seventh Semester **Max. Marks:** 50 **Weightage:** 50%

CO - Levels	CO1	CO2	CO5
Marks	92	66	22

PART A: Answer Following Questions. 10 M

Q.N.	Questions	M	CO	BT
1	Define Empirical Risk Minimization (ERM) and state its main objective.	2	CO1	BT1
2	What is VC-dimension? State what it indicates about a learning model.	2	CO1	BT1
3	What is the purpose of the sigmoid function in Logistic Regression?	2	CO2	BT1
4	Define the kernel trick used in Support Vector Machines.	2	CO2	BT1
5	Define entropy and write its mathematical expression for a binary variable.	2	CO5	BT1

PART B : Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT
6	Explain the Empirical Risk Minimization (ERM) framework in Machine Learning. Discuss empirical risk, expected risk, loss function, overfitting, and the limitations of ERM.	10	CO1	BT2
7	Explain Principal Component Analysis (PCA) as a dimensionality reduction technique. Describe the major steps involved in PCA and explain how PCA helps reduce the number of features while preserving important information.	10	CO1	BT2

PART C: Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT
8	Consider a dataset containing 10 samples, where 6 samples belong to Class A and 4 samples belong to Class B. Calculate the entropy of the dataset. Interpret the obtained value.	10	CO5	BT3
9	A dataset contains 20 samples, divided into two classes: Class A = 12 Class B = 8 A feature is used to split the dataset into two subsets: Subset 1: 8 Class A, 2 Class B Subset 2: 4 Class A, 6 Class B Calculate the following: a) the entropy of the original dataset. b) the entropy of Subset 1. c) the entropy of Subset 2. d) the weighted entropy after the split. e) the Information Gain obtained from the split.	10	CO5	BT3

PTO (Please Turn Over)

PART D: Answer Any 1 Following Questions. 10 M				
Q.N.	**Questions**	**M**	**CO**	**BT**
10	Explain Logistic Regression in detail. Discuss its mathematical formulation, sigmoid function, probability interpretation, decision boundary, and classification process.	10	CO2	BT2
11	Explain Support Vector Machine (SVM) as a maximum-margin classifier. Discuss the decision boundary, margin, support vectors, and the role of kernels in handling non-linearly separable data.	10	CO2	BT2

PART E: Answer Any 1 Following Questions. 10 M				
Q.N.	**Questions**	**M**	**CO**	**BT**
12	Explain entropy and cross-entropy loss in Machine Learning. Discuss their mathematical formulations, interpretation, and importance in classification problems.	10	CO1	BT2
13	Explain Structural Risk Minimization (SRM) and discuss how model complexity and regularization help control overfitting.	10	CO1	BT2