R20

Code No: R20A6601

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

III B.Tech I Semester Supplementary Examinations, June 2025

Machine Learning

(CSE-AIML)

Roll No										

Time: 3 hours **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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			BCLL	CO(s)	Marks
		SECTION-I			
1	***A***	Explain perspectives and issues in Machine Learning.	**L4**	**CO-I**	**[7M]**
	B	Explain about decision tree with example.	**L4**	**CO-I**	**[7M]**
		OR			
2	***A***	Discuss the mathematical formulation of Principal Component Analysis (PCA). Derive the eigenvalue decomposition approach used in PCA. Explain how the principal components are calculated and their role in reducing the dimensionality of a dataset.	**L3**	**CO-I**	**[7M]**
	B	Describe the step-by-step procedure for implementing Principal Component Analysis (PCA) on a dataset. How would you handle the issues of scaling, variance retention, and overfitting while applying PCA to a real-world problem?	**L4**	**CO-I**	**[7M]**
		SECTION-II			
3	***A***	Compare and contrast Simple Linear Regression and Multiple Linear Regression.	**L5**	**CO-II**	**[7M]**
	B	Explain K-nearest neighbour algorithm.	**L4**	**CO-II**	**[7M]**
		OR			
4	***A***	Explain the Gradient Descent algorithm. Describe how it is used to minimize the cost function in both Simple and Multiple Linear Regression.	**L2**	**CO-II**	**[7M]**
	B	Discuss the Support Vector Machine (SVM) algorithm and its application in classification tasks.	**L4**	**CO-II**	**[7M]**
		SECTION-III			
5	***A***	Explain Baye's theorem with example.	**L4**	**CO-III**	**[7M]**
	B	Describe Naive Bayes classifier	**L3**	**CO-III**	**[7M]**
		OR			
6	***A***	Explain least squared error hypothesis.	**L4**	**CO-III**	**[7M]**
	B	Explain Bayes's optimal classifer.	**L2**	**CO-III**	**[7M]**
		SECTION-IV			
7	***A***	What is K-Fold Cross Validation and how does it help in improving model performance? Discuss how Stratified K-Fold Cross Validation differs from regular K-Fold and its importance in imbalanced datasets.	**L2**	**CO-IV**	**[7M]**

	B	What is Bagging in ensemble learning? Discuss how it reduces variance and improves model stability. Describe the working of Random Forest, which is a specific form of Bagging, and explain how it enhances the performance of decision tree models.	**L2**	**CO-IV**	**[7M]**
		OR			
8	***A***	What is regularization in the context of classification models? Explain the purpose of L1 (Lasso) and L2 (Ridge) regularization. How do these techniques help prevent overfitting, and what is their impact on the model's coefficients?	**L2**	**CO-IV**	**[7M]**
	B	Explain how Random Forest is an extension of Bagging. Discuss the role of randomness in Random Forest models, both in terms of feature selection and data sampling. What advantages does Random Forest offer over traditional decision trees?	**L2**	**CO-IV**	**[7M]**
		SECTION-V			
9		Discuss the K-Means clustering algorithm in detail. Explain the steps involved in the algorithm, the choice of distance metric, and the method of selecting initial cluster centroids. What are the limitations of K-Means, and how can they be addressed?	**L4**	**CO-V**	**[14M]**
		OR			
10	***A***	Describe the Expectation-Maximization (EM) algorithm used in Gaussian Mixture Models. Explain how the EM algorithm works, detailing the Expectation (E) step and the Maximization (M) step. Provide an example where EM can be applied in clustering and discuss its convergence properties.	**L4**	**CO-V**	**[7M]**
	B	How does Q-Learning address the challenge of temporal credit assignment in reinforcement learning? Explain the role of delayed rewards and how Q-Learning learns from them. Provide an example of how Q-Learning handles long-term rewards in a decision-making task.	**L5**	**CO-V**	**[7M]**

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