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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: VI**

Branch: Electronics & Communication Engineering **Duration: 3 hrs.**

Course Code: 23EC6PE2ML / 22EC6PE2ML **Max Marks: 100**

Course: MACHINE LEARNING

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	*CO*	*PO*	Marks
1	a)	Explain Python data types with examples: list, tuple, and dictionary.	1	1	**6**
	b)	Discuss the role of data preprocessing using NumPy and Pandas in ML workflows.	1	1	**6**
	c)	Interpret the challenges in Machine Learning and explain different ML types with examples.	2	2	**8**
		OR			
2	a)	Write a Python function using conditional and looping statements to calculate the factorial of a number.	1	1	**6**
	b)	Explain the importance of data visualization using Matplotlib with examples.	1	1	**6**
	c)	Differentiate between AI and ML. Discuss problems that ML can solve.	2	2	**8**
		UNIT - II			
3	a)	Derive the gradient descent formula for linear regression.	2	2	**6**
	b)	Compare L1 and L2 regularization with appropriate equations.	2	2	**6**
	c)	Implement the multiple linear regression model for a dataset 'data' given with five features and one target column using python.	3	3	**8**
		OR			
4	a)	Describe the evaluation metrics MAE, MSE, RMSE, and R2-score with examples.	*2*	*2*	**10**
	b)	Using a suitable dataset, outline the steps to build and evaluate a polynomial regression model using python.	*3*	*3*	**10**
		UNIT - III			
5	a)	Develop the pseudocode for kNN algorithm and discuss it's variants: k-radius and kD tree.	3	3	**8**
	b)	Analyze the decision tree splitting criteria: gini and entropy.	*2*	*2*	**8**
	c)	Discuss the importance of pruning in decision trees.	2	2	**4**
		OR			
6	a)	Describe the concept of ensemble methods: Bagging and Boosting.	2	2	**6**

		b)	Write a Python code to build and evaluate a Random Forest classifier for a given dataset of (X,y). Assume that the dataset is cleaned and all the columns are of numeric type.	3	3	**8**
		c)	Illustrate the use of confusion matrix and classification report in evaluating classifiers.	2	2	**6**
			UNIT - IV			
	7	a)	Explain the working of Naive Bayes classifier with relevant equation.	1	1	**6**
		b)	Write a python code to develop a binary classifier model using logistic regression	*3*	*3*	**8**
		c)	Discuss the use of log loss, Jaccard index, and accuracy score as performance metrics.	2	2	**6**
			OR			
	8	a)	Derive the logistic regression hypothesis using the sigmoid function.	1	1	**7**
		b)	Write a python code to develop a binary classifier model using Gaussian Naïve Baye's algorithm.	*3*	*3*	**8**
		c)	Briefly explain the Bernoulli Naive Baye's and its application.	*2*	*2*	**5**
			UNIT - V			
	9	a)	Given the data table, apply the K-Means clustering algorithm to partition the dataset into clusters. Given K=2 and centroids as: x1=(2, 3, 3, 1) and x2=(3, 2, 2, 2). Apply cosine similarity as distance measure and iterate once through the steps and show if there is mobility of the centroids. f1 f2 f3 f4 A 1 2 3 1 B 2 1 2 2 C 3 4 3 1 D 4 3 2 2	*1*	*1*	**10**
		b)	Discuss various hierarchical clustering algorithms used in unsupervised learning.	*2*	*2*	**10**
			OR			
	10	a)	Describe the basic architecture of an Artificial Neural Network. Mention few examples of Deep Learning applications.	*1*	*1*	**10**
		b)	Mention different linkage methods used for agglomerative clustering.	*2*	*2*	**5**
		c)	Outline the importance of feature scaling and transformation in unsupervised ML.	*2*	*2*	**5**

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