Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV/DEC 2025

Fourth Semester

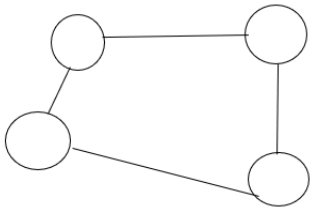
Artificial Intelligence and Data Science

AL3451 - Machine Learning

Regulations - 2021

Duration : 3 Hrs | Maximum : 100 Marks

PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)

Q.No	Questions	BLT	CO	Marks
1.	Define PAC learning.	L1	1	2
2.	Identify the VC dimension of the given set of points. 	L3	1	2
3.	Differentiate linear regression and logistic regression.	L2	2	2
4.	What is a “good” classification model?	L1	2	2
5.	How can we make k-means robust to outliers?	L1	3	2
6.	Mention the types of Ensemble Methods.	L1	3	2
7.	State the purpose of adding momentum in multilayer perceptron.	L2	4	2
8.	What is vanishing gradient problem?	L1	4	2
9.	List down the types of resampling methods.	L1	5	2
10.	Compare Bootstrapping and Cross -Validation.	L2	5	2

PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)

Q.No			Questions	BLT	CO	Marks
11.	a	i	Why learn Linear Algebra before learning Machine Learning?	L2	1	8
		ii	Describe briefly about some examples of linear algebra in machine learning.	L2	1	8
			Or			
	b	i	With the bull’s eye diagram explain the bias-variance trade off in machine learning.	L2	1	8
		ii	Write a note on the importance of statistics in machine learning and summarize the basics statistics involved in defining the model.	L2	1	8
12.	a	i	Suppose 10000 patients get tested for flu; out of them, 9000 are actually healthy and 1000 are actually sick. For the sick people, a test was positive for 620 and negative for 380. For the healthy people, the same test was positive for 180 and negative for 8820. Construct a confusion matrix for the data and compute the precision and recall for the data.	L3	2	8

ii The sales of a company (in million dollars) for each year are shown in the table below. L3 2 8

x (year)	2005	2006	2007	2008	2009
y (sales)	12	19	29	37	45

a) Find the least square regression line y = a x + b.
b) b) Use the least squares regression line as a model to estimate the sales of the company in 2012.

Or

b Apply decision tree learning algorithm for the given dataset which assess student's performance during the course of study and identify the root node of the decision tree. The target class attribute is 'Job offer'. L3 2 16

CGPA	Interactiveness	Practical Knowledge	Communication Skills	Job offer
≥9	Yes	Very good	Good	Yes
≥8	No	Good	Moderate	Yes
≥9	No	Average	Poor	No
<8	No	Average	Good	No
≥8	Yes	Good	Moderate	Yes
≥9	Yes	Good	Moderate	Yes
<8	Yes	Good	Poor	No
≥9	No	Very good	Good	Yes
≥8	Yes	Good	Good	Yes
≥8	Yes	Average	Good	Yes

13. a i Develop the implementation steps of boosting technique with your own example. L3 3 8

ii Implement the stacking technique to predict how multiple nodes to build a new model and improve model performance. L3 3 8

Or

b i Apply K-Nearest neighbor algorithm to the student's performance dataset. The target variable is 'Result'. L3 3 8

CGPA	Assessment	Project Submitted	Result
9.2	85	8	Pass
8	80	7	Pass
8.5	81	8	Pass
6	45	5	Fail
6.5	50	4	Fail
8.2	72	7	Pass
5.8	38	5	Fail
8.9	91	9	Pass

Classify the test instance (6.1,40,5) using Euclidean distance with K=3.

ii Cluster the given dataset using K-Means algorithm with the initial cluster centroids as (4,6) and (12,4) with K=2. L3 3 8

X	Y
2	4
4	6
6	8
10	4
12	4

14.	a	Design a perceptron to learn the given data and update the weights using perceptron training rule.	L4	4	16

X_1	X_2	Y
0	0	0
0	1	0
1	0	0
1	1	1

Or

	b	i	As more layers using certain activation functions are added to neural networks, the gradients of the loss function approaches zero, making the network hard to train. Discuss your answer.	L4	4	8
		ii	Analyze the usage of hyperparameter tuning in neural networks.	L4	4	8
15.	a	i	Summarize the guidelines for doing machine learning experiments.	L2	5	8
		ii	Classify different strategies of experimentation with 2 factors and 5 levels each.	L2	5	8

Or

	b	i	Explain the t-test algorithm in detail for comparing classification algorithms.	L2	5	8
		ii	Explain the performance of Machine Learning classifiers using Paired t-test.	L2	5	8