Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 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 VC dimension.	L1	1	2
2.	What is an Alternative hypothesis?	L1	1	2
3.	Write an example equation for linear regression.	L2	2	2
4.	List any four discriminative models used in machine learning.	L1	2	2
5.	Identify the need for ensemble methods in machine learning.	L3	3	2
6.	State the applications K-means clustering algorithm in real world.	L1	3	2
7.	Draw a simple perceptron model with two inputs and a single output.	L3	4	2
8.	Identify any two regularization mechanism used by neural networks to avoid overfitting.	L3	4	2
9.	What is the validation set approach?	L1	5	2
10.	Indicate the purpose of McNemar's test.	L2	5	2

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

Q.No			*Questions*	*BLT*	*CO*	*Marks*
11.	a		Illustrate the types of learning methodologies used in machine learning with suitable examples.	L2	1	16
			Or			
	b	i	Write short notes on hypothesis in machine learning.	L2	1	8
		ii	Describe the ways to secure the machine learning models to improve the generalization.	L2	1	8
12.	a	i	A dataset of laptop configurations and their corresponding prices is given below:	L3	2	8

RAM (_1x1	SSD (GB)	Processor Gen	Price (₹ in 1000s)
8	256	10	52
8	512	11	60
16	512	11	72
16	1024	12	85
32	1024	13	95

Predict the price of a laptop with 16 GB RAM, 512 GB SSD, and a 12th Gen processor.

ii For the given dataset in (12.a.i), Perform residual analysis and discuss the appropriateness of the linear model. L3 2 8

Or

b Apply the Naive Bayes classifier to predict the class for a new record: Outlook = Sunny, Temp = Cool, Humidity = High, Wind = Strong, using the dataset below: L3 2 16

Outlook	Temp	Humidity	Wind	Play
Sunny	Hot	High	Weak	No
Sunny	Hot	High	Strong	No
Overcast	Hot	High	Weak	Yes
Rain	Mild	High	Weak	Yes
Rain	Cool	Normal	Weak	Yes
Rain	Cool	Normal	Strong	No

13. a You are given the output probabilities of three classifiers on a binary classification task for a test sample: L4 3 16

Classifier	Prob(Class=1)
Model A	0.6
Model B	0.75
Model C	0.4

Model A has 80% accuracy on validation data, Model B has 85%, and Model C has 70%. Compare the result of majority voting, average probability, and weighted voting using validation accuracy as weights.

Or

b You are classifying 2D data using KNN with different values of k: 1, 5, and 15. Visualize and compare the decision boundaries formed for each k and explain how the choice of k affects the bias-variance trade-off. L4 3 16

14. a Illustrate the working of neural networks and their types with neat diagram. L2 4 16

Or

b Explain in detail about the various strategies used for hyperparameter tuning in neural networks. L2 4 16

15. a Outline the working of K-fold cross-validation. Discuss how stratified K-fold differs from standard K-fold and in what scenarios it is preferable. L3 5 16

Or

b Mention the various methods of measuring classifier performance with suitable example. L3 5 16