Name: **Enrolment No:**	

UPES

End Semester Examination, December 2024

Course: Machine Learning **Semester:** V

Program: B. Tech. (Electronics & Computer Engineering) **Time: 03 hrs.**

Course Code: CSAI3013 **Max. Marks: 100**

Instructions: Attempt all the questions

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	(a) What's the penalty term for the Ridge regression? (i) The sum of the square of the magnitude of the coefficients (ii) The sum of the square root of the magnitude of the coefficients (iii) The absolute sum of the coefficients (iv) The sum of the coefficients (b) Bagging is an ensemble technique that: (i) Combines predictions using a weighted average (ii) Trains multiple models on different subsets of the data (iii) Constructs an ensemble by iteratively updating weights (iv) Uses a committee of experts to make predictions (c) Which ensemble learning algorithm assigns weights to base models based on their performance? (i) AdaBoost (ii) Random Forest (iii) Gradient Boosting (iv) None of These (d) What are the advantages of hyperparameter tuning? (i) Improved model performance (ii) Reduce overfitting and underfitting (iii) Optimize resource utilization (iv) All of these	**4**	**CO1**
Q 2	What is the significance of underfitting and overfitting in machine learning algorithms and how it can be resolved in solving complex problems.	**4**	**CO2**
Q 3	(a) Agglomerative clustering algorithm is an example of which type of clustering method? (i) Hierarchical (ii) Partitioning (iii) Density-based (iv) None of these (b) When the hierarchical clustering algorithm uses the maximum distance to measure the distance between clusters then it is called as	**4**	**CO3**

	(i) Single linkage algorithm (ii) Complete linkage algorithm (iii) Double linkage algorithm (iv) None of these (c) Which clustering technique identify arbitrary shaped clusters. (i) Hierarchical (ii) k-means (iii) Density-based (iv) None of these (d) DBSCAN algorithm stands for_____		
Q 4	(a) The cell body of neuron can be analogous to what mathematical operation? (i) Summing (ii) Differentiator (iii) Integrator (iv) None of these (b) What is generalization? (i) the ability of a pattern recognition system to approximate the desired output values for pattern vectors which are not in the test set. (ii) the ability of a pattern recognition system to approximate the desired output values for pattern vectors which are not in the training set. (iii) Both (i) and (ii) (iv) None of the these (c) Neural network is also referred to as: (i) Neurocomputer (ii) Connectionist network (iii) Parallel distributed processor (iv) All of these (d) Which activation function in neural network is differential? (i) Threshold (ii) ReLU (ii) Sigmoid (iv) All of these	**4**	**CO4**
Q 5	Explain McCulloch-Pitts Model of a Neuron.	**4**	**CO4**
SECTION B **(4Qx10M= 40 Marks)**			
Q 6	Differentiate the following: **(Any Two)** (a) Gradient Boost and XGBoost (b) Decision Tree and Random Forest (c) kNN regressor and Support vector regressor	**10**	**CO1**
Q 7	(a) What is logistic regression? How is this algorithm different from conventional regression algorithms. Explain this algorithm with a suitable example. (b) Explain how gradient descent algorithm is used to solve regression problems.	**10**	**CO2**
Q 8	What do you understand by principal component analysis (PCA)? Explain the steps involves in PCA with a suitable example.	**10**	**CO3**
Q 9	What is the significance of weights, bias and activation function in neural network? Explain the following activation function with neat diagrams. (i) Threshold function (ii) Sigmoid function (iii) ReLU function (iv) Softmax function **OR**	**10**	**CO4**

	Differentiate the following: (i) Learning rate and Epochs (ii) Plasticity and Generalization (iii) Multi-layer neural network and Radial basis function neural network (iv) Error Correction learning and Competitive learning		
	SECTION-C **(2Qx20M=40 Marks)**		
Q 10	(a) Explain the performance parameters of regression and classification algorithms. (b) Design a decision tree for the data shown in the table below. The data list weather, temperature, humidity and wind of different days of New Delhi based on which kids decide whether to go or not goes out to play.	**20**	**CO2**
Q 11	(a) Describe the structure of an artificial neuron. Derive the expression of weight change in a multi-layer neural network using back-propagation algorithm. (b) What is perceptron? Which type of problems can be solved using perceptron? Explain how perceptron can be utilized to implement AND and OR gate. **OR**	**20**	**CO4**

Day	Weather	Temperature	Humidity	Wind	Play?
1	Sunny	Hot	High	Weak	No
2	Cloudy	Hot	High	Weak	Yes
3	Sunny	Mild	Normal	Strong	Yes
4	Cloudy	Mild	High	Strong	Yes
5	Rainy	Mild	High	Strong	No
6	Rainy	Cool	Normal	Strong	No
7	Rainy	Mild	High	Weak	Yes
8	Sunny	Hot	High	Strong	No
9	Cloudy	Hot	Normal	Weak	Yes
10	Rainy	Mild	High	Strong	No

	(a) What are the significant parameters which affect the operation of artificial neural network. Differentiate Hebbian learning and memory-based learning with suitable diagrams. (b) What is unconstrained optimization technique in neural network? Differentiate how weights of neural network are optimized using Newton's method and Gauss newton method.		