Roll No. | | | | | | | | | | |

B.E(FT) END SEMESTER EXAMINATIONS – NOV/DEC2024

Computer Science and Engineering
V Semester
CS6301 & MACHINE LEARNING
(Regulation 2018 -RUSA)

Time:3 Hours **Answer ALL Questions** Max.Marks:100

CO1	Differentiate between supervised, unsupervised, semi-supervised machine learning approaches
CO2	Choose and implement classification or regression algorithms for an application using an open source tool
CO3	Implement probabilistic, discriminative and generative algorithms for an application and analyze the results
CO4	Use a tool to implement typical clustering algorithms for different types of applications
CO5	Create potential solutions for real time applications using machine learning techniques

BL – Bloom's Taxonomy Levels (L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

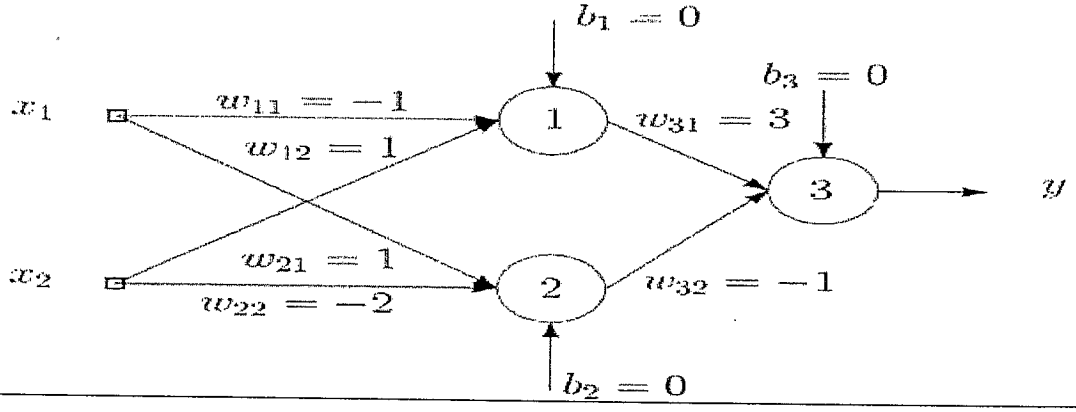
PART-A(10x2=20Marks)

1.	How do you avoid Overfitting and Underfitting in ML Modal?	CO1	L4
2.	Why do you need Semi-Supervised learning? Give example.	CO1	L2
3.	Assume that there are L input nodes, plus the bias, M hidden nodes, also plus a bias and N output nodes. What will be the weights between hidden layer and output layer?	CO2	L3
4.	What are the limitations of Perceptron algorithm? Give the LMS learning rule.	CO2	L1
5.	What is Factor analysis?	CO3	L1
6.	What is Margin and Support vectors in SVM?	CO3	L1
7.	Find the offspring after Multipoint crossover from the parents given below. Cross over points are 3 &6. Parent1→ 10011001101 Parent2→ 10110111001	CO3	L4
8.	What are the differences between SARSA and Q-Learning	CO3	L2
9.	What is the purpose of the neighbourhood function in the SOM? How does it change the learning?	CO4	L2
10.	List the various types of RNN and give example.	CO5	L1

PART –B(8x8=64marks)
(Answer any 8 questions)

11.	Compare Find-S and Candidate Elimination algorithm. Determine the Hypothesis Set using Candidate elimination algorithm for the following sequence of training data.	CO1	L5

Example	Size	Color	Shape	Class/Label
1	Big	Red	Circle	No
2	Small	Red	Triangle	No
3	Small	Red	Circle	Yes
4	Big	Blue	Circle	No
5	Small	Blue	Circle	Yes

12.	Consider a two layered network given below with input x = (x_1, x_2). Each hidden neuron has the rectified linear unit h(z) = max(0, z) as the activation function. Let the input to the network be x = (1, 2) and d = 1 be the desired output. The output unit is linear with loss function J = 1/2 * (y - d) ^ 2 . Compute the output and Loss after the first forward pass and update the weight of w_{31} in first backward pass.  	CO2	L4
13.	A. Find the slope and intercept of regression line for the data given below (Fig. A). Apply linear regression to find the sales percentage of 6th and 7th day based on the following data. (5) B. Can you represent the following boolean function (Fig. B) with a single logistic threshold unit (i.e., a single unit from a neural network)? If yes, show the weights. If not, explain why not in 1-2 sentence. (3)	CO2	L3
14.	Explain the concept behind RBF network. Create a RBF network that solves the XOR function and also with example explain how it is used for classification applications.	CO3	L2
15.	Compare LDA Vs PCA. Consider the following 2D data- (x,y):: Class 1: (2, 3) (5,7) (2 ,9) Class2: (4,1) (3,6) (1,5). Apply PCA or LDA to reduce the dimensions of the data.	CO4	L3

DAY	SALES %
1.	60
2.	70
3.	75
4.	81
5.	88

Fig. A

A	B	f(A,B)
1	1	0
0	0	0
1	0	1
0	1	0

Fig.B

16.	Explain the concept of Expectation maximization algorithm.	CO3	L1
17.	Consider the following training set. Apply k-means clustering to this data set for k=2. Simulate the k-means algorithm for two iterations of cluster assignments. (1,2), (2,2), (3,4), (5,4), (6,5), (2,4), (6,6) and (7,6)	CO5	L3
18.	What is the idea behind KD tree. Construct the KD Tree from the following 2D data points: (4, 5),(1, 6),(3, 1),(7, 5),(2, 7),(2, 3),(5, 8)	CO4	L6
19.	Explain the way to solve the problem of premature convergence in GA and also describe the various operation of Genetic algorithm.	CO3	L2
20.	Explain Bagging and Boosting with example.	CO3	L1
21.	What is reinforcement learning? Explain the concept of Q- learning.	CO1	L2
22	List the advantages of CNN compared with FNN. With neat diagram explain the operations in CNN.	CO5	L2

PART–C(2x8=16marks)

23. Develop a machine learning model for object detection in autonomous vehicles. The objective is to accurately identify and classify objects in real-time. The Dataset contains images from various sensors and the vehicle types. For this application, **CO5** **L6**

a. Give the process flow of the machine learning model.
b. Identify the Features to be used
c. The possible machine learning algorithm to be used to solve the problem.
d. The evaluation strategy to be used

24. Consider the following Data **CO4** **L5**

rec	Age	Income	Student	Credit_rating	Buys_computer(CLASS)
r1	<=30	High	No	Fair	No
r2	<=30	High	No	Excellent	No
r3	31...40	High	No	Fair	Yes
r4	>40	Medium	No	Fair	Yes
r5	>40	Low	Yes	Fair	Yes
r6	>40	Low	Yes	Excellent	No
r7	31...40	Low	Yes	Excellent	Yes
r8	<=30	Medium	No	Fair	No

a) Compute the entropy of the target attribute
b) Construct the decision tree from the above examples using ID3 algorithm. Show the information gain of each attribute at each step in the construction of the tree.