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

B.E (FT) END SEMESTER EXAMINATIONS – MAY/ JUNE 2024

Computer Science and Engineering

VI Semester

CS6301 - MACHINE LEARNING

(Regulation 2018 - RUSA)

Time: 3 Hours **Max. Marks 100**

CO 1	To understand the need for machine learning for various types of problem solving
CO 2	To know the mathematics involved in various machine learning algorithms
CO 3	To study the various supervised, semi-supervised, and unsupervised learning algorithms in ML
CO 4	To learn about probabilistic models in machine learning
CO 5	To have a glimpse of the latest developments in machine learning

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

Answer ALL Questions

PART-A (10 x 2 = 20 Marks)

		Marks	CO	BL
1.	Define distinct instances, syntactically distinct hypotheses and semantically distinct hypotheses.	2	CO1	L1
2.	What is Local Minima in MLP? How to avoid it?	2	CO1	L2
3.	A Doctor wants to diagnose the patient for infection viral or Bacterial based on CRP and Temperature. How will McCulloch & Pitt's Model take a decision?	2	CO1	L3
4.	What is Local mapping in RBF?	2	CO2	L2
5.	Differentiate between Isomap & Locally Linear Embedding	2	CO2	L2
6.	What is the idea behind KD Tree? State its purpose	2	CO4	L3
7.	What is the drawback of Roulette Wheel selection Method? Mention how it can be resolved	2	CO2	L4
8.	Differentiate Exploration & Exploitation in RL	2	CO3	L1
9.	Define Decision stump	2	CO3	L1
10.	If the kernel size is 3x3, Calculate the amount of Padding P	2	CO4	L5

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

<table>
<tr><th></th><th></th><th></th><th>Marks</th><th>CO</th><th>BL</th></tr>
<tr><td>11.</td><td></td><td>Consider the training samples given below: Generate the version space and provide a hand trace of the Candidate Elimination Algorithm by stating the algorithm.

<table>
<tr><th>Eg.</th><th>Shape</th><th>Size</th><th>Color</th><th>Surface</th><th>Thickness</th><th>Target</th></tr>
<tr><td>1</td><td>Circular</td><td>Large</td><td>Light</td><td>Smooth</td><td>Thick</td><td>Malignant(+)</td></tr>
<tr><td>2</td><td>Circular</td><td>Large</td><td>Light</td><td>Irregular</td><td>Thick</td><td>Malignant(+)</td></tr>
<tr><td>3</td><td>Oval</td><td>Large</td><td>Dark</td><td>Smooth</td><td>Thin</td><td>Benign(-)</td></tr>
<tr><td>4</td><td>Oval</td><td>Large</td><td>Light</td><td>Irregular</td><td>Thick</td><td>Malignant(+)</td></tr>
</table></td><td>8</td><td>CO1</td><td>L5</td></tr>
<tr><td>12.</td><td>i)</td><td>Consider the given data. Apply the linear regression technique to examine the relationship between Car Age & Price and predict Price for Car Age = 6 & X= 15.

<table>
<tr><th>Car Age (in Years)</th><th>Price (in Dollars)</th></tr>
<tr><td>4</td><td>6300</td></tr>
<tr><td>4</td><td>5800</td></tr>
<tr><td>5</td><td>5700</td></tr>
<tr><td>5</td><td>4500</td></tr>
<tr><td>7</td><td>4500</td></tr>
<tr><td>7</td><td>4200</td></tr>
<tr><td>8</td><td>4100</td></tr>
<tr><td>9</td><td>3100</td></tr>
<tr><td>10</td><td>2100</td></tr>
<tr><td>11</td><td>2500</td></tr>
<tr><td>12</td><td>2200</td></tr>
</table></td><td>4</td><td>CO1</td><td>L5</td></tr>
<tr><td>12.</td><td>ii)</td><td>Brief about the receptive field in RBF with architecture diagram and how it solves the non-linearity problem</td><td>4</td><td>CO2</td><td>L2</td></tr>
<tr><td>13.</td><td></td><td>Construct the MLP model with 3 inputs, 2 hidden neurons, and 1 output neuron with target value 1 & Learning Rate: 0.9
Input Value: x1=1, x2=0, x3=1
Output Value: y=1
Bias Value: θ4= -0.4, θ5= 0.2, θ6= 0.1
Weights:
w14= -0.4, w15=-0.3,
w24=0.4, w25=0.1,
w34=-0.5, w35=0.2,
w46=-0.3, w56=-0.2

Find the error after forward pass and weight updates for w46 and w56 in the first iteration of back propagation.</td><td>8</td><td>CO2</td><td>L3</td></tr>
</table>

14.		Brief the Concept of PCA. Compute Principal components by applying the PCA algorithm to the following set of points: (4, 1), (2, 3), (5, 4), (1, 0). How many components can be finally kept as principal components? Justify the reason.	8	CO2	L4
15.		Consider the following: Positively labelled data points: (3,1), (3,-1), (6,1), (6,-1) Negatively labelled data points: (1,0), (0,1), (0,-1), (-1,0) Draw an optimal hyperplane to classify the points in SVM.	8	CO4	L5
16.		Maximize the value of the function $f(x)= -x^2+2x$. Over the range of real number from 0 to 2 with initial population 11010, 00111,10110, 00101 with random number 0.4, 0.15, 0.7, 0.9. Select the crossover between the first and fifth digits	8	CO2	L3
17.		Write short notes on the following in Reinforcement Learning a) Off Policy and On Policy decision Making b) Two ways of computing the Expected Reward/Value c) Different Methods for Action Selection Q(a)	8	CO3	L1
18.		The table below consists of training data. Calculate the most informative attribute as split attribute at the 1st level of Decision tree (Based on Information Gain).	8	CO3	L5

Outlook	**Temperature**	**Humidity**	**Windy**	**Class**
Sunny	Hot	High	False	N
Sunny	Hot	High	True	N
Overcast	Hot	High	False	P
Rain	Mild	High	False	P
Rain	Cool	Normal	False	P
Rain	Cool	Normal	True	N
Overcast	Cool	Normal	True	P
Sunny	Mild	High	False	N
Sunny	Cool	Normal	False	P
Rain	Mild	Normal	False	P
Sunny	Mild	Normal	True	P
Overcast	Mild	High	True	P
Overcast	Hot	Normal	False	P
Rain	Mild	High	True	N

19.		Cluster the following points (with (x, y) representing locations) into two clusters: A(2,2) B(3,2) C(1,1) D(3,1) E(1.5,0.5). Use K-Means Algorithm to find the two cluster centers after the 'second iteration'.	8	CO3	L5
20.		Brief about Convolution, Pooling, Padding in CNN with suitable diagram and Explain the working principle of CNN. Describe about convolution operation in monochrome & colour image	8	CO5	L1
21		Explain the following types of Ensemble Learning: a) Bagging b) Boosting c) Random Forest	8	CO3	L2

22	i)	Describe Bidirectional RNN with Computational model diagram	3	CO5	L1
22.	ii)	Apply K nearest neighbour classifier to predict the class with the given features. Assume k = 5. **Test Example:** Sepal Length = 5.2; Sepal Width = 3.1; Class: ?	5	CO4	L5

S.no	Sepal Length	Sepal Width	Species
1	5.3	3.7	Setosa
2	5.1	3.8	Setosa
3	7.2	3.0	Virginica
4	5.4	3.4	Setosa
5	5.1	3.3	Setosa
6	5.4	3.9	Setosa
7	7.4	2.8	Virginica
8	6.1	2.8	Verscicolor
9	7.3	2.9	Virginica
10	6.0	2.7	Verscicolor
11	5.8	2.8	Virginica
12	6.3	2.3	Verscicolor
13	5.1	2.5	Verscicolor
14	6.3	2.5	Verscicolor
15	5.5	2.4	Verscicolor

PART – C (2 x 8 = 16marks)

		Marks	CO	BL
23.	Write Find S algorithm. Apply Find S algorithm and write down the hypothesis each time after observing an example.	8	CO1	L5

eg	citations	size	inLibrary	price	editions	buy
1	some	small	no	affordable	many	no
2	many	big	no	expensive	one	yes
3	some	big	always	expensive	few	no
4	many	medium	no	expensive	many	yes
5	many	small	no	affordable	many	yes

24.	Brief the Concept of LDA and Apply LDA to the following set of points: (4,1),(2,4),(2,3),(3,6),(4,4) belongs to Class 1 and (9,10),(6,8),(9,5),(8,7),(10,8) belongs to Class 2.	8	CO3	L5