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**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**

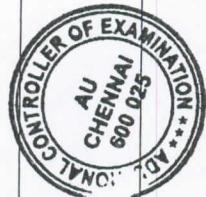
CO 1	To understand the need for machine learning for various types of problem solving
CO 2	To know the mathematics involved in various machine learning algorithms
CO 3	To study the various supervised, semi-supervised, and unsupervised learning algorithms in ML
CO 4	To learn about probabilistic models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

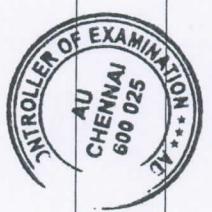
BL – Bloom's Taxonomy Levels (L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analysing, L5 - Evaluating, L6 - Creating)**Answer ALL Questions****PART-A (10 x 2 = 20 Marks)**

		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)

			Marks	CO	BL																																			
11.		Consider the training samples given below: Generate the version space and provide a hand trace of the Candidate Elimination Algorithm by stating the algorithm.	8	CO1	L5																																			
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Eg.</th><th>Shape</th><th>Size</th><th>Color</th><th>Surface</th><th>Thickness</th><th>Target</th></tr> </thead> <tbody> <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> </tbody> </table>	Eg.	Shape	Size	Color	Surface	Thickness	Target	1	Circular	Large	Light	Smooth	Thick	Malignant(+)	2	Circular	Large	Light	Irregular	Thick	Malignant(+)	3	Oval	Large	Dark	Smooth	Thin	Benign(-)	4	Oval	Large	Light	Irregular	Thick	Malignant(+)			
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12.	i)	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.	4	CO1	L5																																			
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12.	ii)	Brief about the receptive field in RBF with architecture diagram and how it solves the non-linearity problem	4	CO2	L2																																			
13.		<p>Construct the MLP model with 3 inputs, 2 hidden neurons, and 1 output neuron with target value 1 & Learning Rate: 0.9</p> <p>Input Value: $x_1=1, x_2=0, x_3=1$</p> <p>Output Value: $y=1$</p> <p>Bias Value: $\theta_4= -0.4, \theta_5= 0.2, \theta_6= 0.1$</p> <p>Weights:</p> <p>$w_{14}= -0.4, w_{15}= -0.3,$ $w_{24}= 0.4, w_{25}= 0.1,$ $w_{34}= -0.5, w_{35}= 0.2,$ $w_{46}= -0.3, w_{56}= -0.2$</p> <p>Find the error after forward pass and weight updates for w_{46} and w_{56} in the first iteration of back propagation.</p>	8	CO2	L3																																			



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																																																																											
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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	Versicolor
9	7.3	2.9	Virginica
10	6.0	2.7	Versicolor
11	5.8	2.8	Virginica
12	6.3	2.3	Versicolor
13	5.1	2.5	Versicolor
14	6.3	2.5	Versicolor
15	5.5	2.4	Versicolor

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																																									
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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																																									