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

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. / B. Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, NOV/DEC 2021

COMPUTER SCIENCE AND ENGINEERING

V Semester

CS6301 & MACHINE LEARNING

(Regulation 2018-Rusa)

Time: 3hrs 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 machine learning
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)

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	How do you avoid Overfitting and Underfitting?	**2**	CO1	L2
2	Compare classification Vs Regression	**2**	CO1	L2
3	What is learning in Perceptron? Give its limitations	**2**	CO2	L2
4	How do you use the chain rule in MLP to update weights?	**2**	CO2	L3
5	What is the significance of using factor analysis?	**2**	CO1	L2
6	What is the basic idea of EM algorithm?	**2**	CO4	L1
7	Consider (10, 12) is the location of a house and (21, 10) is the location of the Police station. Find the Euclidean distance and City-Block distance between the house and the Police Station.	**2**	CO3	L5
8	Which operations in GA are used for exploration and exploitation? Give example.	**2**	CO2	L4
9	What is the use of State-Value function and Action-Value function in Reinforcement learning?	**2**	CO5	L1
10	How large should the neighborhood be in Early learning and also later on in SOM Network?	**2**	CO5	L4

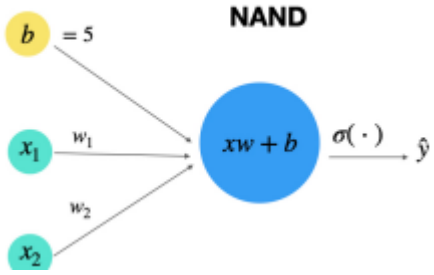
PART- B (8 x 8 = 64 Marks)

(Answer any 8 questions)

Q. No	Questions	Marks	CO	BL
11	Compare and contrast the Supervised learning, Unsupervised learning, Semi supervised learning and Reinforcement learning with an example.	**8**	CO3	L3

<table>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>12</td><td>Apply the Candidate elimination algorithm for the following sequence of training data. Read the Instances. Find S and G after each step.
Table:1
<table><tr><td>Action</td><td>Author</td><td>Thread</td><td>Length</td><td>Where</td></tr><tr><td>Skips</td><td>known</td><td>new</td><td>Long</td><td>Home</td></tr><tr><td>Reads</td><td>unknown</td><td>new</td><td>Short</td><td>Work</td></tr><tr><td>Skips</td><td>unknown</td><td>Old</td><td>Long</td><td>Home</td></tr><tr><td>Skips</td><td>Known</td><td>Old</td><td>Long</td><td>Home</td></tr><tr><td>Reads</td><td>Known</td><td>new</td><td>Short</td><td>Home</td></tr><tr><td>Skips</td><td>known</td><td>Old</td><td>Long</td><td>Work</td></tr></table></td><td>8</td><td>CO1</td><td>L3</td></tr>
<tr><td>13</td><td>Find the Action class using naïve bayes classifier for the following Test data. Training data given in Table:1
<table><tr><td>??</td><td>Known</td><td>New</td><td>Short</td><td>Work</td></tr></table></td><td>8</td><td>C04</td><td>L4</td></tr>
<tr><td>14</td><td>Compare MLP and RBF. Create a MLP/RBF network that solves the XOR function.</td><td>8</td><td>CO2</td><td>L6</td></tr>
<tr><td>15</td><td>Briefly explain the concept of ISOMAP.</td><td>8</td><td>CO3</td><td>L1</td></tr>
<tr><td>16</td><td>Explain the Concept of PCA. Apply PCA to the following set of points: (4, 1), (2, 3), (5, 4), (1, 0).</td><td>8</td><td>CO3</td><td>L3</td></tr>
<tr><td>17</td><td>Explain the concept of Expectation maximization algorithm.</td><td>8</td><td>CO4</td><td>L1</td></tr>
<tr><td>18</td><td>Construct the KD tree from the following data: Suppose that we had seven two-dimensional points to make a tree from:
(6, 5), (1, 6), (6, 1),(7, 5),(2, 7),(3, 3),(5, 8) .
For the following test point find the nearest neighbour (4.5, 3).</td><td>8</td><td>CO5</td><td>L6</td></tr>
<tr><td>19</td><td>Consider the following training set. Apply k-means clustering to this data set for k=2. Simulate the k-means algorithm for cluster assignments until convergence.
(1,2), (2,3), (3,3), (5,4), (6,5), (2,4), (6,6) and (7,6)</td><td>8</td><td>CO4</td><td>L3</td></tr>
<tr><td>20</td><td>Consider the dataset below to learn a decision tree which predicts if students result based on the following features: Studied, Slept, Cheated. Table:2
<table><tr><th></th><th>Studied</th><th>Slept</th><th>Cheated</th><th>Result</th></tr><tr><td>Student 1</td><td>Yes</td><td>No</td><td>No</td><td>Passed</td></tr><tr><td>Student 2</td><td>Yes</td><td>No</td><td>Yes</td><td>Failed</td></tr><tr><td>Student 3</td><td>No</td><td>Yes</td><td>No</td><td>Failed</td></tr><tr><td>Student 4</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Failed</td></tr><tr><td>Student 5</td><td>Yes</td><td>Yes</td><td>No</td><td>Passed</td></tr></table>a. What is the entropy H (Result)?
b. What is the entropy H (Result /Slept)?
c. What is the entropy H Passed / Studied)?
d. Draw the full decision tree that would be learned for this dataset.</td><td>8</td><td>C05</td><td>L4</td></tr>
<tr><td>21</td><td>What are the components of Reinforcement Learning? How to use Sarsa-Learning algorithm to fix the policy.</td><td>8</td><td>C05</td><td>L2</td></tr>
<tr><td>22</td><td>Give the architecture of CNN. Explain how it works.</td><td>8</td><td>CO5</td><td>L4</td></tr>
</table>

PART- C (2 x 8 = 16 Marks)

Q. No	Questions	Marks	CO	BL
23	Design an application of your choice using Machine learning which specifies the following: a. Details of the application including assumptions b. How a human being would tackle the application c. Type of machine learning that is needed. d. Type of representation of the learned information e. The input and the expected output f. Identify the features to be used g. Choose the evaluation strategy	**8**	CO1	L6
24	Consider the following single unit neural network that receives two binary inputs x1, x2 ∈ {0, 1} and computes a linear combination followed by a threshold activation function, namely, $\sigma(z) = \begin{cases} 1, & z \geq 0, \\ 0 & \text{otherwise.} \end{cases}$ The unit is illustrated below. We have chosen a bias term b = 5. Provide values for the two weights w1 and w2 that allow you to compute the NAND function. 	**8**	CO2	L5