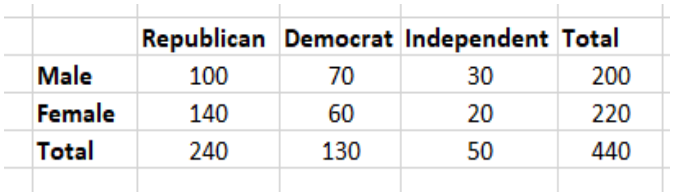
Name of Subject :-	Machine Learning for IT Application Development	DEPT :-	

Sr No.	Questions	CO	Marks
1	State the purpose of Machine Learning	1	2
2	Explain Supervised Learning with an example.	1	2
3	Where do we apply Unsupervised Learning? Write the example	1	2
4	Explain the concepts of "training data" and "test data" in Machine Learning, and why they are essential.	1	2
5	How the machine learning is different from traditional programming	1	2
6	Differentiate Artificial Intelligence, Machine Learning and Deep Learning?	1	2
7	Describe the concepts of Type I and Type II errors in hypothesis testing.	1	2
8	Explain why Hypothesis Testing is important in ML	1	2
9	What are some typical challenges in Machine Learning, including issues like overfitting, underfitting, and data quality problems and how can these issues be mitigated?	1	5
10	Describe Bias and Variance in a Machine Learning Model	1	5
11	Explain in detail, different techniques of unsupervised learning.Interpret the applications of UnSupervised Machine Learning in Modern Businesses	1	5
12	Explain in detail, different techniques of Supervised learning.Interpret the applications of Supervised Machine Learning in Modern Businesses	1	5
13	Contrast "null hypothesis" and "alternative hypothesis"? in hypothesis testing	1	5
14	Describe different types of classification in supervised learning	1	5
15	How to choose a right Machine Learning algorithm for a specific problem.	1	5
16	Explain in detail different stages to develop a Machine Learning Application	1	10
17	Explain different types of machine learning techniques	1	10
18	Analyze various issues in machine learning	1	10
19	Outline the steps involved in conducting a hypothesis test, including how to formu	1	10
20	Apply FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples Time | Weather | Temperature | Company | Humidity | Wind | Goes Morning | Sunny | Warm | Yes | Mild | Strong | Yes Evening | Rainy | Cold | No | Mild | Normal | No Morning | Sunny | Moderate | Yes | Normal | Normal | Yes Evening | Sunny | Cold | Yes | High | Strong | Yes	1	10
21	Apply FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples Example | Sky | AirTemp | Humidity | Wind | Water | Forecast | EnjoySport 1 | Sunny | Warm | Normal | Strong | Warm | Same | Yes 2 | Sunny | Warm | High | Strong | Warm | Same | Yes 3 | Rainy | Cold | High | Strong | Warm | Change | No 4 | Sunny | Warm | High | Strong | Cool | Change | Yes	1	10
22	Compare and contrast Supervised, Unsupervised, and Reinforcement Learning. Discuss the types of problems each type is best suited for, with relevant examples.	1	10
23	Define feature selection and feature extraction.	2	2
24	Explain why the data needs to be preprocessed?	2	2
25	Describe oversampling imbalanced data handling technique.	2	2

<table>
<tr><td>26</td><td>Define Data validation and Data Imputation</td><td>2</td><td>2</td></tr>
<tr><td>27</td><td>State different types of Missing values in dataset</td><td>2</td><td>2</td></tr>
<tr><td>28</td><td>Explain Linear descriminant analysis (LDA)</td><td>2</td><td>2</td></tr>
<tr><td>29</td><td>List down the reason for Data Missing from the Dataset</td><td>2</td><td>2</td></tr>
<tr><td>30</td><td>Discuss why data preprocessing is an important step in ML model designing</td><td>2</td><td>5</td></tr>
<tr><td>31</td><td>Describe the process of data normalization and its importance in Machine Learning.</td><td>2</td><td>5</td></tr>
<tr><td>32</td><td>Discuss the impact of data quality on Machine Learning models, including challenges like missing data and noise.</td><td>2</td><td>5</td></tr>
<tr><td>33</td><td>Differentiate One-Hot Encoding and Label Encoding</td><td>2</td><td>5</td></tr>
<tr><td>34</td><td>Analyze the process of handling outliers in a dataset and its importance in data preprocessing.</td><td>2</td><td>5</td></tr>
<tr><td>35</td><td>What are the advantages and disadvantages of PCA feature extraction technique?</td><td>2</td><td>5</td></tr>
<tr><td>36</td><td>Explain Auto encoder feature extraction technique</td><td>2</td><td>5</td></tr>
<tr><td>37</td><td>Explain different ways of data preprocessing in machine learning</td><td>2</td><td>10</td></tr>
<tr><td>38</td><td>Illustrate different feature transformation techniques used in data preprocessing</td><td>2</td><td>10</td></tr>
<tr><td>39</td><td>Justify “For an imbalanced class dataset F1 score is a more appropriate metric”. Also, evaluate different approaches to handle imbalanced dataset problem</td><td>2</td><td>10</td></tr>
<tr><td>40</td><td>Explain different types of Feature Selection Methods used in machine learning</td><td>2</td><td>10</td></tr>
<tr><td>41</td><td>Consider the dataset with two features (2D data). Apply PCA dimension reduction technique to modify it to one dimension.
(2, 3) (3, 5) (5, 8) (8, 12) (10, 15)</td><td>2</td><td>10</td></tr>
<tr><td>42</td><td>Consider the dataset with two features (2D data). Apply PCA dimension reduction technique to modify it to one dimension.
(3, 4) (2, 5) (5, 6) (7, 10) (10, 14)</td><td>2</td><td>10</td></tr>
<tr><td>43</td><td>Consider the following table and decide how chi-square test is useful to know if gender has anything to do with political party preference. Note: for degree of freedom 2 and alpha level of 0.05, tabulated value is 5.991

<table><tr><th></th><th>Republican</th><th>Democrat</th><th>Independent</th><th>Total</th></tr><tr><td>Male</td><td>100</td><td>70</td><td>30</td><td>200</td></tr><tr><td>Female</td><td>140</td><td>60</td><td>20</td><td>220</td></tr><tr><td>Total</td><td>240</td><td>130</td><td>50</td><td>440</td></tr></table></td><td>2</td><td>10</td></tr>
<tr><td>44</td><td>Describe regression in the context of machine learning</td><td>3</td><td>2</td></tr>
<tr><td>45</td><td>Distinguish Regression with respect to Classification</td><td>3</td><td>2</td></tr>
<tr><td>46</td><td>State key assumptions about simple linear regression</td><td>3</td><td>2</td></tr>
<tr><td>47</td><td>Explain the concept of dependent and independent variables in regression.</td><td>3</td><td>2</td></tr>
<tr><td>48</td><td>Evaluate polynomial regression. How does it handle non-linear relationships?</td><td>3</td><td>2</td></tr>
<tr><td>49</td><td>Discuss advantages and disadvantages of linear regression</td><td>3</td><td>2</td></tr>
<tr><td>50</td><td>Give an example of a real-world application where logistic regression is used effectively for classification</td><td>3</td><td>2</td></tr>
<tr><td>51</td><td>Define regularization in the context of machine learning</td><td>3</td><td>2</td></tr>
<tr><td>52</td><td>Interpret the role of the least squares method in linear regression</td><td>3</td><td>5</td></tr>
<tr><td>53</td><td>Differentiate simple linear regression and multiple linear regression techniques</td><td>3</td><td>5</td></tr>
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<tr><td>54</td><td>The below table shows the marks obtain by student in midterm and final year exam. 1) Construct equation of predication (linear Regression formula)
2) Predict final year marks if the midterm marks is 40?

<table><tr><th>Midterm marks (X)</th><th>Final exam marks (Y)</th></tr><tr><td>45</td><td>60</td></tr><tr><td>70</td><td>70</td></tr><tr><td>60</td><td>54</td></tr><tr><td>84</td><td>82</td></tr><tr><td>75</td><td>68</td></tr><tr><td>84</td><td>76</td></tr></table></td><td>3</td><td>5</td></tr>
<tr><td>55</td><td>The below table shows the glucose level with respect to age of a person.
1) Construct equation of predication (linear Regression formula).
2) Predict glucose level for age 55.

<table><tr><th>Age (X)</th><th>Glucose level (Y)</th></tr><tr><td>43</td><td>99</td></tr><tr><td>21</td><td>65</td></tr><tr><td>25</td><td>79</td></tr><tr><td>42</td><td>75</td></tr><tr><td>57</td><td>87</td></tr><tr><td>59</td><td>81</td></tr></table></td><td>3</td><td>5</td></tr>
<tr><td>56</td><td>How can you assess the performance of a linear regression model? What evaluation metrics can be used?</td><td>3</td><td>5</td></tr>
<tr><td>57</td><td>Differentiate between Linear Regression and Logistic Regression. How do their output and use cases differ?</td><td>3</td><td>5</td></tr>
<tr><td>58</td><td>Explain the logistic function (sigmoid function) and its role in logistic regression. What is its formula, and why is it used?</td><td>3</td><td>5</td></tr>
<tr><td>59</td><td>Discuss key advantages of using fuzzy clustering over traditional clustering metho</td><td>3</td><td>5</td></tr>
<tr><td>60</td><td>Suppose we have the following dataset with one response variable y and two predictor variables X1 and X2. Construct the final regression equation or model.

<table><tr><th>y</th><th>X_1</th><th>X_2</th></tr><tr><td>140</td><td>60</td><td>22</td></tr><tr><td>155</td><td>62</td><td>25</td></tr><tr><td>159</td><td>67</td><td>24</td></tr><tr><td>179</td><td>70</td><td>20</td></tr><tr><td>192</td><td>71</td><td>15</td></tr><tr><td>200</td><td>72</td><td>14</td></tr><tr><td>212</td><td>75</td><td>14</td></tr><tr><td>215</td><td>78</td><td>11</td></tr></table></td><td>3</td><td>10</td></tr>
<tr><td>61</td><td>Discuss two popular regularization techniques, such as L1 (Lasso) and L2 (Ridge) regularization.</td><td>3</td><td>10</td></tr>
</table>

<table>
<tr><td>62</td><td>Consider the data points {(1, 3), (2, 5), (4, 8), (7, 9)} along with the initial membership values for 2 clusters as given below. Revise the membership values for the given data points using fuzzy c means clustering.

<table><tr><td>Clusters</td><td colspan="4">Points</td></tr><tr><td></td><td>(1,3)</td><td>(2,5)</td><td>(4,8)</td><td>(7,9)</td></tr><tr><td>1</td><td>0.8</td><td>0.7</td><td>0.2</td><td>0.1</td></tr><tr><td>2</td><td>0.2</td><td>0.3</td><td>0.8</td><td>0.9</td></tr></table></td><td>3</td><td>10</td></tr>
<tr><td>63</td><td>How will you decide which evaluation metrics to use for a particular problem, and what factors will be considered when making that choice?</td><td>3</td><td>10</td></tr>
<tr><td>64</td><td>The dataset of pass or fail in an exam of 5 students is given in the table. Use logistic regression as classifier to answer the following questions
a) Calculate the probability of pass for the students who studied 33 hours
b) At least how many hours’ students should study so that he will pass the course with the probability of more than 95% Assume the model suggested by the optimizer for odds of passing the course is, Log (odds)= - 64 + 2 * hours

<table><tr><td>Hour’s study</td><td>Pass (1)/Fail (0)</td></tr><tr><td>29</td><td>0</td></tr><tr><td>15</td><td>0</td></tr><tr><td>33</td><td>1</td></tr><tr><td>28</td><td>1</td></tr><tr><td>39</td><td>1</td></tr></table></td><td>3</td><td>10</td></tr>
<tr><td>65</td><td>Provide an overview of the BIRCH algorithm. Apply its hierarchical clustering approach, focusing on its ability to handle large datasets by incrementally building a cluster hierarchy.</td><td>3</td><td>10</td></tr>
<tr><td>66</td><td>Provide an example of a real-world scenario where regression analysis can be applied effectively. Explain the specific problem domain, the variables involved, and how regression analysis can be used to make predictions.</td><td>3</td><td>10</td></tr>
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<table>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>1</td><td>Define a Support Vector Machine (SVM) and explain its primary purpose in machine learning.</td><td>4</td><td>2</td></tr>
<tr><td>2</td><td>Define the k-Nearest Neighbours (KNN) algorithm and explain its fundamental principle.</td><td>4</td><td>2</td></tr>
<tr><td>3</td><td>Define the CART algorithm and explain its primary purpose in machine learning</td><td>4</td><td>2</td></tr>
<tr><td>4</td><td>Define Bagging as ensemble methods in machine learning</td><td>4</td><td>2</td></tr>
<tr><td>5</td><td>State the issues in decision tree learning</td><td>4</td><td>2</td></tr>
<tr><td>6</td><td>Justify the statement “KNN is called as lazy learner algorithm”</td><td>4</td><td>2</td></tr>
<tr><td>7</td><td>Define Boosting as ensemble methods in machine learning</td><td>4</td><td>2</td></tr>
<tr><td>8</td><td>Explain the core idea behind Bagging and how it differs from Boosting in terms of how base models are combined.</td><td>4</td><td>5</td></tr>
<tr><td>9</td><td>Describe the concept of a margin in SVMs. How does the margin relate to the separation of data points in SVM classification?</td><td>4</td><td>5</td></tr>
<tr><td>10</td><td>Compare and contrast linear and non-linear SVMs. Discuss when you would choose one over the other</td><td>4</td><td>5</td></tr>
<tr><td>11</td><td>Discuss the impact of choosing a larger value of "k" in KNN. How does it affect the model's bias and variance, and what considerations should be made when selecting an appropriate "k"?</td><td>4</td><td>5</td></tr>
<tr><td>12</td><td>Consider the data with attributes (acid durability and strength) to classify whether a special paper tissue is good or not. For new sample with X1=3 and x2=7, predict the classification value using KNN algorithm with K=3

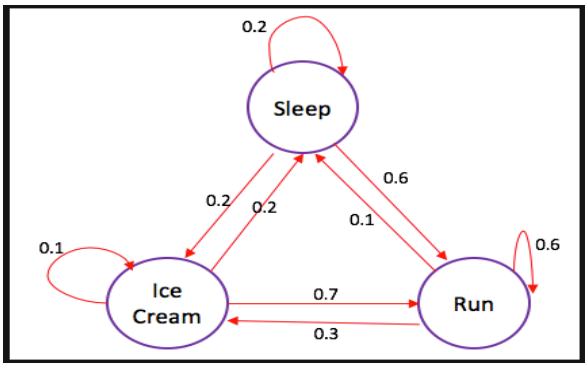
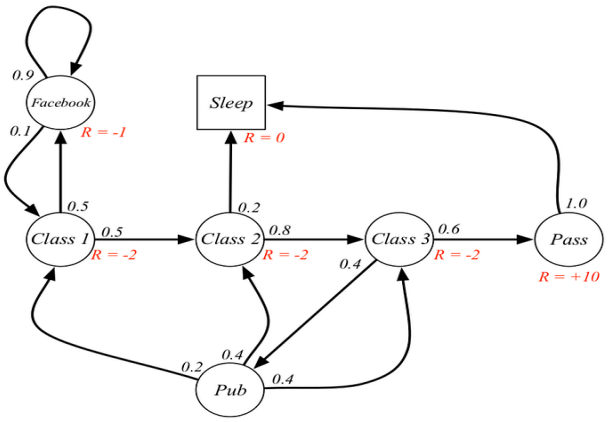
<table><tr><td>X1-Acid durability</td><td>X2-Strengh</td><td>y-Classification</td></tr><tr><td>7</td><td>7</td><td>Bad</td></tr><tr><td>7</td><td>4</td><td>Bad</td></tr><tr><td>3</td><td>4</td><td>Good</td></tr><tr><td>1</td><td>4</td><td>Good</td></tr></table></td><td>4</td><td>5</td></tr>
<tr><td>13</td><td>Compare and contrast the Gini impurity and entropy as criteria for splitting nodes in a decision tree.</td><td>4</td><td>5</td></tr>
<tr><td>14</td><td>For the given data of sports, on which age and gender are taking a part in a decision on ‘what kind of person would play ground-game? Find the root node of a decision tree using CART. Note: consider age =< 25 and age > 25.

<table><tr><th>Age</th><th>Gender</th><th>Sportive</th></tr><tr><td>22</td><td>F</td><td>yes</td></tr><tr><td>24</td><td>M</td><td>yes</td></tr><tr><td>30</td><td>F</td><td>yes</td></tr><tr><td>31</td><td>F</td><td>no</td></tr><tr><td>27</td><td>F</td><td>no</td></tr><tr><td>32</td><td>M</td><td>no</td></tr><tr><td>25</td><td>F</td><td>yes</td></tr><tr><td>30</td><td>M</td><td>no</td></tr><tr><td>24</td><td>F</td><td>yes</td></tr><tr><td>21</td><td>F</td><td>yes</td></tr><tr><td>29</td><td>M</td><td>yes</td></tr><tr><td>26</td><td>M</td><td>no</td></tr><tr><td>21</td><td>M</td><td>no</td></tr></table></td><td>4</td><td>5</td></tr>
</table>

<table>
<tr><td>15</td><td>For the given dataset, draw a decision tree using Gini index

PlayTennis: training examples
<table><tr><th>Day</th><th>Outlook</th><th>Temperature</th><th>Humidity</th><th>Wind</th><th>PlayTennis</th></tr><tr><td>D1</td><td>Sunny</td><td>Hot</td><td>High</td><td>Weak</td><td>No</td></tr><tr><td>D2</td><td>Sunny</td><td>Hot</td><td>High</td><td>Strong</td><td>No</td></tr><tr><td>D3</td><td>Overcast</td><td>Hot</td><td>High</td><td>Weak</td><td>Yes</td></tr><tr><td>D4</td><td>Rain</td><td>Mild</td><td>High</td><td>Weak</td><td>Yes</td></tr><tr><td>D5</td><td>Rain</td><td>Cool</td><td>Normal</td><td>Weak</td><td>Yes</td></tr><tr><td>D6</td><td>Rain</td><td>Cool</td><td>Normal</td><td>Strong</td><td>No</td></tr><tr><td>D7</td><td>Overcast</td><td>Cool</td><td>Normal</td><td>Strong</td><td>Yes</td></tr><tr><td>D8</td><td>Sunny</td><td>Mild</td><td>High</td><td>Weak</td><td>No</td></tr><tr><td>D9</td><td>Sunny</td><td>Cool</td><td>Normal</td><td>Weak</td><td>Yes</td></tr><tr><td>D10</td><td>Rain</td><td>Mild</td><td>Normal</td><td>Weak</td><td>Yes</td></tr><tr><td>D11</td><td>Sunny</td><td>Mild</td><td>Normal</td><td>Strong</td><td>Yes</td></tr><tr><td>D12</td><td>Overcast</td><td>Mild</td><td>High</td><td>Strong</td><td>Yes</td></tr><tr><td>D13</td><td>Overcast</td><td>Hot</td><td>Normal</td><td>Weak</td><td>Yes</td></tr><tr><td>D14</td><td>Rain</td><td>Mild</td><td>High</td><td>Strong</td><td>No</td></tr></table></td><td>4</td><td>10</td></tr>
<tr><td>16</td><td>Discuss the theoretical foundations and practical applications of Support Vector Machines (SVM) in machine learning. Illustrate your answer with appropriate examples and diagrams where necessary.</td><td>4</td><td>10</td></tr>
<tr><td>17</td><td>Compare and contrast Bagging and Boosting in terms of their approach to handling model diversity. How does each method encourage diversity among base models, and how does this impact ensemble performance?</td><td>4</td><td>10</td></tr>
<tr><td>18</td><td>Compare and contrast the strengths and weaknesses of classification algorithms like KNN, decision trees, and support vector machines. Under what circumstances would you prefer to use these alternatives?</td><td>4</td><td>10</td></tr>
<tr><td>19</td><td>Design a scenario in which KNN can be applied to solve a practical problem. Specify the dataset characteristics, explain how you would preprocess the data, and outline the steps to choose the most suitable "k" value for the problem.</td><td>4</td><td>10</td></tr>
<tr><td>20</td><td>Design a scenario where an SVM can be applied to solve a practical problem. Outline the dataset requirements, preprocessing steps, kernel choice, and hyperparameter tuning process</td><td>4</td><td>10</td></tr>
<tr><td>21</td><td>Suppose you have trained an SVM model for a classification task. Discuss the performance evaluation metrics you would use to assess the model's quality and provide guidelines on interpreting the results.</td><td>4</td><td>10</td></tr>
<tr><td>22</td><td>What is the difference between training error and validation error in model selection?</td><td>5</td><td>2</td></tr>
<tr><td>23</td><td>Provide a brief overview of why optimization is crucial in the context of training machine learning models.</td><td>5</td><td>2</td></tr>
<tr><td>24</td><td>What challenges can arise when applying optimization techniques to large-scale machine learning models?</td><td>5</td><td>2</td></tr>
<tr><td>25</td><td>What is the bias-variance tradeoff, and how does it impact model selection?</td><td>5</td><td>2</td></tr>
<tr><td>26</td><td>What is the validation set used for in hyperparameter tuning?</td><td>5</td><td>2</td></tr>
<tr><td>27</td><td>How does cross-validation help in assessing the performance of a machine learning model?</td><td>5</td><td>2</td></tr>
<tr><td>28</td><td>Differentiate between model selection and Model evaluation</td><td>5</td><td>2</td></tr>
<tr><td>29</td><td>What are the advantages and disadvantages of using grid search for hyper-parameter tuning?</td><td>5</td><td>5</td></tr>
<tr><td>30</td><td>Discuss how Cross-Validation and Regularization techniques be employed to address the issues of overfitting and underfitting?</td><td>5</td><td>5</td></tr>
<tr><td>31</td><td>Differentiate between local and global optimization strategies. How do these approaches impact the performance of machine learning algorithms?</td><td>5</td><td>5</td></tr>
</table>

32	Compare and contrast stochastic gradient descent (SGD) with mini-batch gradient descent.	5	5
33	Clarify the importance of model selection in machine learning. Provide three key factors that influence the decision-making process when selecting a model for a specific task.	5	5
34	Explain how gradient descent algorithm works and provide an example of a scenario where it can be applied.	5	5
35	Explain the concept of hyper parameter tuning in machine learning. Why is it important, and how does it differ from model training?	5	5
36	Differentiate between types of gradient descent algorithm with an example.	5	10
37	Describe the concept of cross-validation in machine learning. Explain how k-fold cross-validation works, and highlight its significance in assessing and improving the performance of machine learning models.	5	10
38	Describe the algorithm of Steepest Descent method in detail by considering one example.	5	10
39	Discuss the importance of model performance metrics in evaluating different hyperparameter settings. Evaluate how Random Search can be a more efficient alternative to Grid Search, including its advantages and potential drawbacks.	5	10
40	Discuss the steps taken to select a machine learning model for a classification problem. Include in your response the functions of model training, validation, and testing. How does each step help to ensure that the selected model performs effectively on new data?	5	10
41	Discuss the steps for defining the search space, assess performance, and for selecting the best hyperparameters while designing a Random Search-based hypertuning strategy.	5	10
42	Discuss, how the learning rate impacts the convergence of Gradient Descent. Discuss the differences between Adaptive Gradient Descent methods (such as AdaGrad, RMSprop, and Adam) and traditional Gradient Descent. Include the advantages and limitations of these adaptive methods.	5	10
43	Define semi-supervised learning in the context of machine learning.	6	2
44	How does semi-supervised learning leverage both labeled and unlabeled data in training?	6	2
45	Define reinforcement learning.	6	2
46	Analyze the potential risks or challenges of using semi-supervised learning in situations with limited labeled data.	6	2
47	State and explain the advantages of semi-supervised learning	6	2
48	Provide examples of real-world applications where reinforcement learning has been successfully employed.	6	2
49	Describe two key benefits of using reinforcement in machine learning applications.	6	2
50	Discuss the challenges of semi-supervised learning in machine learning	6	5
51	Provide an example of a real-world problem where semi-supervised learning would be beneficial.	6	5
52	Analyze the benefits of using semi-supervised learning techniques, especially in scenarios with limited labeled data. How does leveraging unlabeled data enhance the accuracy and efficiency of machine learning models?	6	5
53	Discuss the application of Autonomous Vehicles and how to improve Decision-making processes for self-driving cars.	6	5
54	Explain the key elements of reinforcement learning, including agents, environments, actions, and rewards. How do these elements interact within the reinforcement learning framework?	6	5

55	Justify with following diagram that Markov Process is the memory less random process 	6	5
56	For the given Markov Decision proces calculate rewards for a) Start state is Class 1, move to Class 2, then class 3, then pass, then sleep. b) Start at pub and go to sleep through class 2 . 	6	5
57	What is Reinforcement Learning? How does it differ from other types of Machine Learning, such as Supervised Learning and unsupervised learning?	6	10
58	How is Reinforcement Learning utilized in game AI? Provide an example of a popular game where Reinforcement Learning has been applied.	6	10
59	Explain the concept of the reward function in Reinforcement Learning. Why is it important for the learning process? Evaluate the limitations and challenges faced by reinforcement learning methods. Propose potential solutions	6	10
60	Explain the basic idea behind Q-learning as a Reinforcement Learning algorithm. How does it help an agent learn optimal actions?	6	10
61	Elaborate the application of Reinforcement Learning in robotics. How is it used to improve robotic behaviors and optimize decision-making?	6	10
62	Describe the benefits of using semi-supervised learning techniques, especially in scenarios with limited labeled data. How does leveraging unlabeled data enhance the accuracy and efficiency of machine learning models?	6	10
63	Analyze specific use cases of reinforcement learning in different domains, such as robotics, gaming, or autonomous systems. How does reinforcement learning optimize decision-making in these applications?	6	10

Sr No.	Questions	CO	RBT	PI	Marks	Type theoretical or numerical
1	Define semi-supervised learning in the context of machine learning.	6	U	2.5.1	2	T
2	How does semi-supervised learning leverage both labeled and unlabeled data in training?	6	AN	4.4.2	2	T
3	Define reinforcement learning.	6	R	1.6.2	2	T
4	Analyze the potential risks or challenges of using semi-supervised learning in situations with limited labeled data.	6	AN	2.5.2	2	T
5	State and explain the advantages of semi-supervised learning	6	U	3.5.1	2	T
6	Provide examples of real-world applications where reinforcement learning has been successfully employed.	6	A	3.5.1	2	T
7	Describe two key benefits of using reinforcement in machine learning applications.	6	U	2.6.4	2	T
8	Discuss the challenges of semi-supervised learning in machine learning	6	AN	2.5.2	5	T
9	Provide an example of a real-world problem where semi-supervised learning would be beneficial.	6	A	3.5.1	5	T
10	Analyze the benefits of using semi-supervised learning techniques, especially in scenarios with limited labeled data. How does leveraging unlabeled data enhance the accuracy and efficiency of machine learning models?	6	AN	2.6.4	5	T
11	Discuss the application of Autonomous Vehicles and how to improve Decision-making processes for self-driving cars.	6	C	4.6.3	5	T
12	Explain the key elements of reinforcement learning, including agents, environments, actions, and rewards. How do these elements interact within the reinforcement learning framework?	6	AN	2.6.4	5	T
13	Justify with following diagram that Markov Process is the memory less random process	6	AN	2.6.4	5	N
14	For the given Markov Decision proces calculate rewards for a) Start state is Class 1, move to Class 2, then class 3, then pass, then sleep. b) Start at pub and go to sleep through class 2 .	6	AN	2.6.4	5	N
15	What is Reinforcement Learning? How does it differ from other types of Machine Learning, such as Supervised Learning and unsupervised learning?	6	AN	4.6.3	10	T
16	How is Reinforcement Learning utilized in game AI? Provide an example of a popular game where Reinforcement Learning has been applied.	6	A	3.5.1	10	T

17	Explain the concept of the reward function in Reinforcement Learning. Why is it important for the learning process? Evaluate the limitations and challenges faced by reinforcement learning methods. Propose potential solutions	6	E	4.4.2	10	T
18	Explain the basic idea behind Q-learning as a Reinforcement Learning algorithm. How does it help an agent learn optimal actions?	6	E	4.4.2	10	T
19	Elaborate the application of Reinforcement Learning in robotics. How is it used to improve robotic behaviors and optimize decision-making?	6	C	2.5.2	10	T
20	Describe the benefits of using semi-supervised learning techniques, especially in scenarios with limited labeled data. How does leveraging unlabeled data enhance the accuracy and efficiency of machine learning models?	6	E	4.4.2	10	T
21	Analyze specific use cases of reinforcement learning in different domains, such as robotics, gaming, or autonomous systems. How does reinforcement learning optimize decision-making in these applications?	6	AN	2.5.2	10	T