	Harcourt Butler Technical University Kanpur		END SEM (2023-24)
Branch	**M.C.A**	Program	**M.C.A**
Course Name	**Machine Learning**	Semester	**IV**
Course Code	**ECA-554**	Year	**II**
Time	**2:30Hr**	Maximum Marks	**50**

Knowledge Level (KL)			
	K1: Remembering	**K3:** Applying	**K5:** Evaluating
	K2: Understanding	**K4:** Analyzing	**K6:** Creating

Note: Answer All Questions

Q. No	Questions	Marks	COs	KL
Q.1	**Attempt all parts.**			
(a)	Define Machine Learning? What are the ingredients of Machine Learning? Explain different perspective and issues in machine learning.	5	CO1	K2
(b)	Discuss various types of tasks that can be performed using Machine Learning. Elaborate your answer with suitable examples and applications.	5	CO1	K2
Q.2	**Attempt all parts.**			
(a)	While predicting Win-Loss of teams in World Cup Football using a classification Model, following are the data recorded: Correct Predictions: 73 Wins, 13 Losses Incorrect Predictions: 9 Wins, 5 Losses Calculate the accuracy, sensitivity, precision, and F-Measure of the Model.	5	CO2	K2
(b)	What is a Perceptron? Explain the working of a perceptron with a neat diagram.	5	CO2	K2
Q.3	**Attempt all parts.**			
(a)	What is a target function? Express target function in context of a real life example. Explain bias-variance trade-off in context of model fitting. OR Consider the following dataset with one input (x) and output (y): {(x=1, y=2) (x=2, y=1) (x=3, y=2) Apply linear regression on this data, using the hypothesis $h_{\ominus}(x) = \ominus_0 + \ominus_1 (x)$, where $\ominus_0$ and $\ominus_1$ represent the parameters to be learned. Considering learning rate α, write the iterative steps showing how values of $\ominus_0$ and $\ominus_1$ are updated in each iteration. Assuming α=0.1, and initial values $\ominus_0$ = 1.0 and $\ominus_1$ = 0.0, perform the first three iterations and state the resulting model. Show the steps clearly.	5	CO3	K5
(b)	Suppose, you get very poor performance (i.e. very high error rate) out of your machine learning model. Would you apply *hit and trial* approach or prefer to explore available options systematically? Explain all the diagnostic and corrective measures at your hand under such situation.	5	CO3	K2, K4

<table>
<tr><td>Q.4</td><td>Attempt all parts.</td><td></td><td></td><td></td></tr>
<tr><td>(a)</td><td>Discuss the advantages and disadvantages of decision tree based model for machine learning. Illustrate the algorithm for best split based on information gain criteria with the help of an example.</td><td>5</td><td>CO4</td><td>K2</td></tr>
<tr><td>(b)</td><td>Following is the training data for a group of athletes. Based on this data, use K-NN algorithm and classify Rohan (Weight = 56 kg, Speed = 10 kmph) as a Good, Average or Poor sprinter.

<table>
<tr><th>Name</th><th>Weight (Kg)</th><th>Speed (Kmph)</th><th>Class</th></tr>
<tr><td>Nitesh</td><td>55</td><td>9</td><td>Average</td></tr>
<tr><td>Gurpreet</td><td>58</td><td>8</td><td>Poor</td></tr>
<tr><td>Gautam</td><td>60</td><td>7.5</td><td>Poor</td></tr>
<tr><td>Gulshan</td><td>59</td><td>8.5</td><td>Average</td></tr>
<tr><td>Mohit</td><td>57</td><td>10</td><td>Good</td></tr>
<tr><td>Sahil</td><td>53</td><td>10.5</td><td>Good</td></tr>
<tr><td>Samyak</td><td>53</td><td>10</td><td>Good</td></tr>
</table></td><td>5</td><td>CO4</td><td>K5</td></tr>
<tr><td>Q.5</td><td>Attempt all parts.</td><td></td><td></td><td></td></tr>
<tr><td>(a)</td><td>State the Bayes Rule and explain how it is applied to pattern classification problems. Show that in a multiclass classification task the Bayes decision rule minimizes the error probability.</td><td>5</td><td>CO5</td><td>K2</td></tr>
<tr><td>(b)</td><td>Write short notes on any two:
(i) K-Means Clustering Technique
(ii) Bagging and Boosting in machine Learning
(iii) Deep Learning</td><td>5</td><td>CO5</td><td>K2, K4</td></tr>
</table>

Course Outcomes	**CO1**	Understanding Machine learning and Machine Learning Models. (Understand)
	CO2	Apply Various classification and regression techniques and asses their performance. (Apply)
	CO3	Apply various clustering algorithm for the problems to be solved with machine learning. (Apply)
	CO4	Assessment of various machine learning models. (Analyze)
	CO5	Understand probabilistic learning models and trends in machine learning. (Understand)

Date of showing evaluated answer books: 29.05.2024