

JK Lakshmipat University, Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY
 End Term Exam, December 2023
 BCA, Semester V

Subject: **Machine Learning (CS1138)**

Time: 2:30 hours

Roll No.....

Max. Marks: 30

Note: Assume suitable data wherever required and mention it clearly.

Q. 1	a. In a fraud detection system, if the model correctly identifies 90% of fraudulent transactions (sensitivity) and has a false positive rate of 5%, calculate the precision of the model. b. In a recommendation system, if the top-5 recommendations for a user include 3 items they like, what is the precision at 5 for this user?	5 CO 1																				
Q. 2	In a multiclass problem with four classes, the confusion matrix sums up to: <table><tr><td> 20</td><td>5</td><td>3</td><td>2</td><td> </td></tr><tr><td> 3</td><td>25</td><td>2</td><td>1</td><td> </td></tr><tr><td> 1</td><td>3</td><td>15</td><td>1</td><td> </td></tr><tr><td> 0</td><td>2</td><td>1</td><td>10</td><td> </td></tr></table> Calculate precision, recall, and F1 score.	20	5	3	2		3	25	2	1		1	3	15	1		0	2	1	10		5 CO 2
20	5	3	2																			
3	25	2	1																			
1	3	15	1																			
0	2	1	10																			
Q. 3	Use the elbow method to determine the optimal number of clusters in a k-means clustering. The sum of squared distances (SSE) for different values of k are k=2 (SSE=150), k=3 (SSE=80), k=4 (SSE=50), k=5 (SSE=30). What is the optimal number of clusters?	5 CO 3																				
Q. 4	For the sigmoid activation function $\sigma(x)=1/(1+e^{-x})$, calculate the output for $x=2$ and $x=-2$. What is the range of values the sigmoid function produces?	5 CO 4																				
Q. 5	Suppose a perceptron is trained using the perceptron learning rule, and during an iteration, the weights are updated as follows: $w_1=0.6$, $w_2=-0.7$, $b=0.3$. If the correct output for a given input is 1, and the predicted output is 0, discuss how the weights and bias were adjusted.	5 CO 4																				
Q. 6	Calculate the silhouette score for a clustering with the following pairwise distances: $(1, 2) = 0.4$, $(1, 3) = 0.2$, $(2, 3) = 0.6$, and the average intra-cluster distance for cluster 1 is 0.3, and for cluster 2 is 0.5. OR Suppose you have a machine learning model with a high bias and low variance. It has a mean squared error (MSE) on the training set of 36 and an MSE on the test set of 49. Calculate the bias and variance of this model.	5 CO 5																				

All the best!