University of Engineering & Management, Kolkata

Even Semester Term- I Examination, March, 2021

Course: B.Tech(CS) Semester:4th

Paper Name: Artificial Intelligence & Machine Learning Advanced

Paper Code: PCCCS405

Full Marks: 70 Time: 2 hours

Answer all questions. Each question is of 10 marks.

1. **A)** Consider the following dataset and build the confusion matrix and find out accuracy, precision and recall.

ID	student	credit rating	Actual	Predicted
1	no	fair	no	yes
2	no	excellent	no	no
3	no	fair	yes	yes
4	yes	excellent	no	no
5	yes	excellent	yes	no
6	no	fair	no	no
7	no	excellent	yes	yes
8	yes	fair	yes	no
9	no	excellent	no	yes

OR

B) Consider the following dataset and build the confusion matrix and find out accuracy, precision and recall

ID	student	credit rating	Actual	Predicted
1	no	fair	no	no
2	no	excellent	no	no
3	no	fair	no	yes
4	yes	excellent	no	no
5	yes	excellent	yes	yes
6	no	fair	no	yes
7	no	excellent	no	yes
8	yes	fair	yes	yes
9	no	excellent	no	no

2. **A)** From the table below established the relationship between X and Y Established the relationship between X and Y using least squared linear regression. Find the R squared error of estimate. 5+5

OR

B) From the table below find the Pearson's Coefficient of Correlation. Established the relationship between X and Y using least squared linear regression. 5+5

X	Y
95	85
85	95
80	70
70	65
60	70

3. **A)** Describe bias and variance. Suppose your model is not performing as well as expected. Is it a bias problem or a variance problem? –explain 5+5

OR

B) **D**escribe the difference between overfitting and underfitting. Describe any two popular methods of evaluating a classifier for model selection. 5+5

4. **A)** Derive the parameter values in linear regression using method of least square regression and calculus.

OR

B) Derive the parameter values in linear regression using method of least square regression and gradient descent algorithm.

5. **A)** How logistic regression differs from linear regression? Explain with an example. Why linear regression is not for classification problem? Explain with an example. 5+5

OR

B) Explain sigmoid function and discuss how the hypothesis value varies in the range of 0 to 1.

6. **A)** Explain how decision boundary helps to classify i) binary class ii) multiple class. 5+5

OR

B) "A decision boundary can be linear or non linear." Is this statement is correct? Justify your answer. Find the values of all Θs and x's if decision boundary is ellipse for the given hypothesis: $h_\Theta(x) = g\ (\Theta 0 + \Theta 1\ x_1 + \Theta 2\ x_2 + \Theta 3(x_1)^2 + \Theta 4\ (x_2)^2)$. Also plot it to classify positive and negative class. 5+5

7. A) Why linear regression cost function can not be used for logistic regression? Explain the logistic regression cost function with required graphs. 5+5

OR

B) Explain different parts of a decision tree. How many types of trees are possible? Explain different categories of splitting attributes. (3+2)+5