This question paper contains 4+2 printed pages]

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

S. No. of Question Paper : 2645

Unique Paper Code : 32347607 IC

Name of the Paper : **Machine Learning**

Name of the Course : **B.Sc. (Hons.) Computer Science : DSE-3**

Semester : **VI**

Duration : **3 Hours** Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Section A is compulsory.

Attempt any **4** questions from Section B.

Use of scientific calculator is allowed.

Section A (Compulsory)

1. (*a*) For a classification problem to classify 250 training instances into two classes TRUE and FALSE, the prediction pattern of a classifier is shown below :

(I) 120 TRUE class instances classified as TRUE

P.T.O.

(2) 85 TRUE class instances classified as FALSE

(3) 25 FALSE class instances classified as TRUE

(4) 20 FALSE class instances classified as FALSE

Find the accuracy of this classifier. 4

(*b*) State Naïve Bayes theorem. 2

(*c*) List and explain *three* applications of machine learning. 3

(*d*) Why can't linear regression be used for classification ? Explain with the help of an example. 3

(*e*) Write the expression for cost function of logistic regression and explain it. 3

(*f*) What do you mean by polynomial regression ? Explain it with an example. 3

(*g*) How does single layer perceptron function ? 3

(*h*) Draw the diagram of a neural network required to handle five class problems. 3

(*i*) What do you mean by reinforcement learning ? Give an example. 3

(*j*) Give an expression of binary sigmoidal activation function and obtain first derivative of the function. 3

(*k*) The sales of a company (in million rupees) for each year are shown in the table below : 5

x (year)	*y* (sales)
2005	12
2006	19
2007	29
2008	37
2009	45
2010	49

(*a*) Find the least square regression line $y = ax + b$.

(*b*) Use the least squares regression line as a model to estimate the sales of the company in 2013.

Section B

2. Using Naïve Bayes classification rule for the following training data, predict whether an old student having high income and excellent credit rating will buy a computer or not. 10

Id	Age	Income	Student	Credit Rating	Buys Computer
1.	Young	High	No	Fair	No
2.	Young	High	No	Excellent	No
3.	Middle	High	No	Fair	Yes
4.	Old	Medium	No	Fair	Yes
5.	Old	Low	Yes	Fair	Yes
6.	Old	Low	Yes	Excellent	No
7.	Middle	Low	Yes	Excellent	Yes
8.	Young	Medium	No	Fair	No
9.	Young	Low	Yes	Fair	Yes
10.	Old	Medium	Yes	Fair	Yes
11.	Young	Medium	Yes	Excellent	Yes
12.	Middle	Medium	No	Excellent	Yes
13.	Middle	High	Yes	Fair	Yes
14.	Old	Medium	No	Excellent	No

3. (*a*) What is over-fitting in logistic regression ? How can this problem be resolved ? 6

(*b*) Discuss the classification of Machine Learning algorithms. 4

4. (*a*) Find the linear regression coefficients using gradient descent method for the following dataset when learning rate = 0.1. Carry out the process for 2 iterations. 5

X	Y
0	2
1	3
2	5
3	4
4	6

(*b*) Explain how can logistic regression be used for solving more than two class problems ? 5

5. (*a*) What is the cost function for linear regression ? Derive least square estimation of the coefficients ? 5

(*b*) Explain *two* methods of updating weights for a single layer perceptron. 5

6. (*a*) Explain the gradient descent method for obtaining the parameters of Logistic regression. 6

(*b*) Differentiate between Linear regression and Logistic regression. 4

7. (*a*) Explain Back-propagation algorithm for multilayer perceptron. 6

(*b*) Write the truth table of OR operation and solve it using single layer perceptron. 4