III SEMESTER MCA
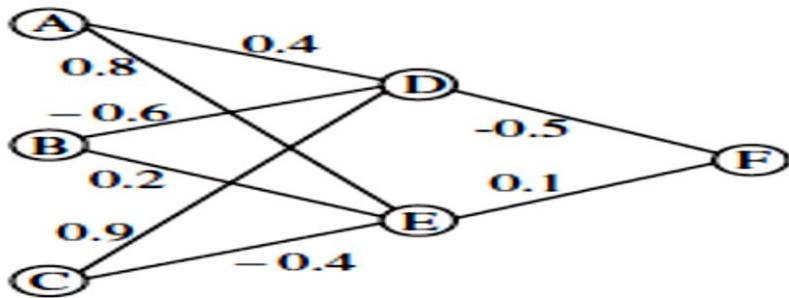**IN SEMESTER EXAMINATION – I, 23 NOV 2021**
SUBJECT: MACHINE LEARNING (MCA-5152)

Time: 110 Minutes   **MAX. MARKS: 30**

Note: Answer ALL the questions.

1	Consider the following data set which predicts whether a customer is a 'Loan Non-Defaulter' based on the 'Amount of Savings (in Lakhs)'. The logistic regression analysis on the training data set using the maximum likelihood estimate gave the following output. The coefficients are β_0= **-4.07778** and β_1= **1.5046.** a. For the following test data set predict the class label using Logistic Regression b. Compute the Confusion Matrix of the Classifier Model and comment on the Performance.	4

Savings (in Lakhs)	0.5	0.85	1	1.25	1.75	1.75	2.25	3.25	4.25	5
Non-Defaulter	0	0	0	0	0	1	1	1	1	1

2	For the following Neural Network: a. Consider a training instance [0,1,0,1]. Compute the Output at F after feed of the training instance to the neural network. b. After 1 instance of the training, compute the change in weights of the Neural Network.	3

3	With suitable examples , differentiate between: a. Bias vs. Variance b. Parametric Models vs. Non parametric Models c. Soft Clustering Vs Hard Clustering	3

4	What is Inductive Bias? List any two biases that can be imposed on a machine learning model	2

5	What is over fitting? What are the strategies to avoid overfitting in a decision tree induction model?	2
6	Ms. Jepkoech, a Data Analyst at the Smart Swiss Biscuits Ltd, summarized statistics of two data sets of biscuit strength measurements as shown below: Sample A: 209 129 194 132 173 381 282 283 518 267 Sample B: 203 274 381 282 283 518 267 309 334 417 422. a. Compute the 5 number summary for the given samples A and B individually. b. Draw the side-by-side boxplot for the data given. Draw your inferences.	3
7	Given the following data predict whether the tuple (1.5, 2.5) belongs to Class A or Class B using the principles of Maximum Likelihood Estimation.	3

	μ_x	μ_y	σ_x	σ_y
Class A	-0.09	5.83	4.02	0.78
Class B	-2.78	-2.04	2.08	0.80

8	What does the confusion matrix represent? Define the following Classification Accuracy Measures and compute them from the confusion matrix provided below. (i) Accuracy Rate (ii) Misclassification Rate (iii) sensitivity (iv) specificity	3

classes	buy computer = yes	buy computer = no	total
buy computer = yes	6950	50	7000
buy computer = no	420	2580	3000
total	7370	2630	10000

9	Write down the basic steps of performing Gradient descent Algorithm with relevant formulae / Equations where necessary. Also write the objective function of Gradient Descent for a Linear Regression problem.	**3**

10	**Answer the following:**
	   a) Define the terms Line, Plane and Hyperplane in the context of SVM.
	   b) What is MMH (Maximum Margin Hyperplane) in SVM?
	   c) Illustrate the concept of MMH with a neat labelled diagram for a binary classification problem.
	   d) Write the distance formula for MMH describing the variables.
		2

11	What is the role of a Regularizer on a Cost function? Write the mathematical representation of a cost function using a Regularizer and explain all the variables.	**2**