Reg No.:_______________ Name:__________________________

0520MCA201122101

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Third Semester MCA (2 Year) Degree Examination December 2021

Course Code: 20MCA201

Course Name: DATA SCIENCE AND MACHINE LEARNING

Max. Marks: 60 Duration: 3 Hours

PART A

Answer all questions, each carries3 marks. Marks

1 What is data science and why do we need data science? (3)

2 Explain the different types of data. (3)

3 Explain the differences between supervised and unsupervised machine learning algorithms. (3)

4 What are the strengths and weaknesses of K-NN algorithm (3)

5 How to simplify a decision tree by pruning. (3)

6 Explain the Ordinary Least Square method in regression. (3)

7 Define activation function. Give two examples. (3)

8 What is maximum margin hyperplane? (3)

9 What is K-fold cross validation? (3)

10 Explain bootstrap sampling (3)

PART B

Answer any one question from each module. Each question carries 6 marks.

Module I

11 Explain the various processes for preparing a dataset to perform a data science task. (6)

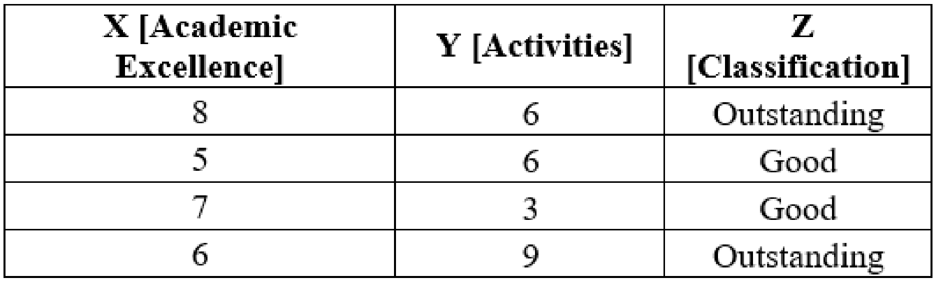
OR

12 The tensile strength in megapascals for 15 samples of tin were determined and found to be: 34.61, 34.57, 34.40, 34.63, 34.63, 34.51, 34.49, 34.61, 34.52, 34.55, 34.58, 34.53, 34.44, 34.48 and 34.40. Calculate the mean and standard deviation from the mean for these 15 values, correct to 4 significant figures. (6)

Module II

13 Based on the survey conducted in an institution the students are classified based on the 2 attributes academic excellence and other achievements. Consider the data set given. Find the classification of a student with value of X is 5 and Y is 7 (6)

based on the data of trained samples using KNN algorithm. Choose k = 3



X [Academic Excellence]	Y [Activities]	Z [Classification]
8	6	Outstanding
5	6	Good
7	3	Good
6	9	Outstanding

OR

14 Consider a training data set consisting of the fauna of the world. Each unit has 3 features named “Swim”, “Fly” and “Crawl”. Let the possible values of these features be as follows: (6)

Swim - Fast, Slow, No

Fly - Long, Short, Rarely, No

Crawl - Yes, No

For simplicity, each unit is classified as “Animal”, “Bird” or “Fish”. Let the training data set be as in the table below . Use naive Bayes algorithm to classify a particular species if its features are (Slow, Rarely,No)

Sl. No.	Swim	Fly	Crawl	Class
1	Fast	No	No	Fish
2	Fast	No	Yes	Animal
3	Slow	No	No	Animal
4	Fast	No	No	Animal
5	No	Short	No	Bird
6	No	Short	No	Bird
7	No	Rarely	No	Animal
8	Slow	No	Yes	Animal
9	Slow	No	No	Fish
10	Slow	No	Yes	Fish

11	No	Long	No	Bird
12	Fast	No	No	Bird

Module III

15 Consider the following set of training examples: (6)

Instance	Classification	a1	a2
1	+	T	T
2	+	T	T
3	-	T	F
4	+	F	F
5	-	F	T
6	-	F	T

a) Find the entropy of this collection of training examples with respect to the target function “classification”? (3 marks)

b) Calculate the information gain of a2 relative to these training examples? (3 marks)

OR

16 How to estimate the parameters of a linear regression model ? (6)

Module IV

17 Discuss the basic idea behind the back propagation algorithm. (6)

OR

18 a) Define linearly separable dataset. Give an example each of a dataset that is linearly separable and of a dataset that is not linearly separable. (3 marks) (6)

b) Define kernel function. Explain the kernel trick to construct a classifier for a dataset that is not linearly separable. (3 marks)

Module V

19 Suppose 10000 patients get tested for flu; out of them, 9000 are actually healthy and 1000 are actually sick. For the sick people, a test was positive for 620 and (6)

negative for 380. For the healthy people, the same test was positive for 180 and negative for 8820. Construct a confusion matrix for the data and compute the precision and recall for the data.

OR

20 Explain the concepts of bagging and boosting. (6)

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