

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VII (NEW) EXAMINATION – WINTER 2021****Subject Code:3171617****Date:17/12/2021****Subject Name:Applied Machine Learning****Time:10:30 AM TO 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) Define machine learning. Describe in brief the key tasks of machine learning.	03
	(b) How to improve accuracy of the linear regression model? Explain with an example.	04
	(c) Explain, in details, Rosenblatt's perceptron model. How can a set of data be classified using a simple perceptron? Using a simple perceptron with weights w_0 , w_1 , and w_2 as -1 , 2 , and 1 , respectively, classify data points $(3, 4)$; $(5, 2)$; $(1, -3)$; $(-8, -3)$; $(-3, 0)$.	07
Q.2	(a) Define prior, posterior, and likelihood probability.	03
	(b) What is a dependent variable and an independent variable in a linear equation?	04
	(c) An antibiotic resistance test (random variable T) has 1% false positives (i.e. 1% of those not resistance to an antibiotic show positive result in the test) and 5% false negatives (i.e. 5% of those actually resistant to an antibiotic test negative). Let us assume that 2% of those tested are resistant to antibiotics. Determine the probability that somebody who tests positive is actually resistant (random variable D).	07
OR		
	(c) In an exam, there were 20 multiple-choice questions. Each question had 44 possible options. A student knew the answer to 10 questions, but the other 10 questions were unknown to him and he chose answers randomly. If the score of the student X is equal to the total number of correct answers, then find out the probability mass function (PMF) of X. What is $PMF(X > 15)$?	07
Q.3	(a) State the merits and demerits of Bayes classifier.	03
	(b) Is it possible to use Naïve Bayes classifier for continuous numeric data? If so, how?	04
	(c) Discuss the kNN algorithm with an example. Compute the error rate and validation error.	07
OR		
Q.3	(a) What is classification and regression in a supervised learning?	03
	(b) What are the factors determining the effectiveness of SVM?	04
	(c) For preparation of the exam, a student knows that one question is to be solved in the exam which is either of types A, B, or C. The probabilities of A, B, or C appearing in the exam are 30%, 20%, and 50% respectively. During the preparation, the student solved 9 of 10 problems of type A, 2 of 10 problems of type B, and 6 of 10 problems of type C. <ol style="list-style-type: none"> (i) What is the probability that the student will solve the problem of the exam? 	07

(ii) Given that the student solved the problem, what is the probability that it was of type A?

- Q.4** (a) Explain in brief the supervised learning. **03**
(b) Explain multiple linear regression with an example. **04**
(c) How to calculate the distance between the test data and the training data for kNN. Explain with an example. **07**

OR

- Q.4** (a) Distinguish between supervised learning, semi-supervised learning, and unsupervised learning. **03**
(b) Discuss OOB error and variable importance in random forest. **04**
(c) Define slope in a linear regression. Find the slope of the graph where the lower point on the line is represented as $(-3, -2)$ and the higher point on the line is represented as $(2, 2)$. **07**

- Q.5** (a) Define reinforcement learning. Explain the concept of penalty and reward in reinforcement learning **03**
(b) Explain classification steps in brief. **04**
(c) Explain the learning process of an ANN. Explain, with example, the challenge in assigning synaptic weights for the interconnection between neurons? How can this challenge be addressed? **07**

OR

- Q.5** (a) What are the steps in the backpropagation algorithm? Why a multi-layer neural network is required? **03**
(b) Describe the structure of an artificial neuron. How is it similar to a biological neuron? What are its main components? **04**
(c) Write short notes on any two of the following: **07**
(i) Multi-layer Perceptron
(ii) Deep Learning
