GUJARAT TECHNOLOGICAL UNIVERSITY
BE – SEMESTER- VII EXAMINATION-SUMMER 2023
Subject Code: 3171617   **Date: 21/06/2023**
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.**

Q.1	**(a)**	What is machine learning? State the applications of machine learning.	**03**
	(b)	State the difference between Supervised and Unsupervised approaches.	**04**
	(c)	Consider the training data in the following table where Play is a class attribute. In the table, the Humidity attribute has values "L" (for low) or "H" (for high), Sunny has values "Y" (for yes) or "N" (for no), Wind has values "S" (for strong) or "W" (for weak), and Play has values "Yes" or "No".	**07**

Humidity	Sunny	Wind	Play
L	N	S	NO
H	N	W	YES
H	Y	S	YES
H	N	W	YES
L	Y	S	NO

What is class label for the following day (Humidity=L, Sunny=N, Wind=W), according to naïve Bayesian classification?

Q.2	**(a)**	Explain the various methods to perform cross validation.	**03**
	(b)	Define the terms Hypothesis space and Version space. Illustrate with an example.	**04**
	(c)	Use K Means clustering to cluster the following data into two groups. Assume cluster centroid are m1=2 and m2=4. The distance function used is Euclidean distance. { 2, 4, 10, 12, 3, 20, 30, 11, 25 }	**07**

OR

	(c)	An antibiotic resistance test (random variable T) has 2% false positives (i.e. 2% 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**

Q.3	**(a)**	Explain how to learn Multilayer Networks using Gradient Descent Algorithm.	**03**
	(b)	Explain Bayesian belief network and conditional independence with example.	**04**
	(c)	What is Regression? List types of the regression. Explain Linear Regression with proper examples.	**07**

Q.3 **(a)** What is the significance of optimal separating hyperplane in SVM? **03**
(b) Write down the major differences between K-means clustering and **04**
hierarchical clustering.
(c) Illustrate K means clustering algorithm with an example. **07**

Q.4 **(a)** Distinguish between overfitting and underfitting. How it can affect model **03**
generalization?
(b) Compare Classification with a regression with an example. **04**
(c) Explain the Brute Force MAP Learning algorithm. **07**

OR

Q.4 **(a)** What is CNN? State its applications. **03**
(b) A patient takes a lab test and the result comes back positive. It is known that **04**
the test returns a correct positive result in only 98% of the cases and a
correct negative result in only 97% of the cases. Furthermore, only 0.008 of
the entire
The population has this disease.
1. What is the probability that this patient has cancer?
2. What is the probability that he does not have cancer?
3. What is the diagnosis?
(c) Define slope in a linear regression. Find the slope of the graph where the **07**
lower point on the line is represented as $(-7, -6)$ and the higher point on the
line is represented as $(5, 5)$.

Q.5 **(a)** Explain the concept of a Perceptron with a neat diagram. **03**
(b) What is GAN? Explain its Architecture. **04**
(c) Define the following terms **07**
a. Sample error
b. True error
c. Random Variable
d. Expected value
e. Variance
f. standard Deviation
g. Recall

OR

Q.5 **(a)** What are the type of problems in which Artificial Neural Network can be **03**
applied.
(b) Write short note on Q-learning. **04**
(c) Derive the backpropagation rule considering the output layer and training **07**
rule for output unit weights.