

GUJARAT TECHNOLOGICAL UNIVERSITY**ME – SEMESTER –I-(New) EXAMINATION – SUMMER 2019****Subject Code: 3710216****Date: 10/05/2019****Subject Name: Machine Learning****Time: 02:30 PM TO 05:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- | | | Marks |
|------------|---|-------------|
| Q.1 | (a) Answer the following questions: | [07] |
| | (i) Suppose you have a dataset with $m = 1000000$ examples and $n = 200000$ features for each example. You want to use multivariate linear regression to fit the parameters Θ to your data. What will you prefer, gradient descent or normal equation? Justify your answer. | 03
04 |
| | (ii) Is XOR problem solvable using single perceptron? Justify your answer with appropriate reasoning. | |
| | (b) Answer the following questions: | [07] |
| | (i) Differentiate between parametric and non-parametric model. | 03 |
| | (ii) Write a brief note on reinforcement learning. | 04 |
| Q.2 | (a) What do you understand by “Curse of Dimensionality”? Explain PCA in detail. | [07] |
| | (b) Consider a medical diagnostic problem in which there are two alternative hypothesis: (1) that the patient has a particular form of cancer, and (2) that the patient does not. The available data is from particular laboratory test with two possible outcome: (+) positive and (-) negative. We have prior knowledge that over the entire population of people, only 0.008 have this disease. Furthermore, the lab test is only an imperfect indicator of the diseases. The test returns a correct positive result in only 98% of the cases in which the disease is actually present and a correct negative result in only 97% of the cases in which the disease is not present. In other cases, the test returns the opposite result. Suppose, we now observe a patient for whom the lab test returns a positive result. Should we diagnose the patient as having cancer or not? (Solve using Naïve Bayes classification techniques) | [07] |
| | OR | |
| | (b) What is MAP hypothesis? Explain brute force MAP learning algorithm. | [07] |
| Q.3 | (a) For the following data, use information gain and find out the root node for decision tree. | [07] |

Attribute				Class Label
Gender	Car Ownership	Travel Cost	Income Level	Transportation
Male	0	Cheap	Low	Bus
Male	1	Cheap	Medium	Bus
Female	1	Cheap	Medium	Train
Female	0	Cheap	Low	Bus
Male	1	Cheap	Medium	Bus
Male	0	Standard	Medium	Train
Female	1	Standard	Medium	Train
Female	1	Expensive	High	Car
Male	2	Expensive	Medium	Car
Female	2	Expensive	High	Car

- (b) Differentiate between Linear regression and Logistic regression using appropriate example. [07]

OR

- Q.3 (a) What are the issues in Decision tree learning? How to overcome them? [07]
 (b) List the methods to avoid over-fitting. Explain how Regularization reduces the problem of over-fitting. [07]

- Q.4 (a) Answer the following questions: [07]
 (i) Explain how the membership of data sample is determined in fuzzy C-means clustering. 03
 (ii) For the below given confusion matrix, find out accuracy, error rate, sensitivity and specificity. 04
 (b) Summarize K-means algorithm and group the points (1, 0, 1), (1, 1, 0), (0, 0, 1) and (1, 1, 1) using K-means algorithm. [07]

OR

- Q.4 (a) Answer the following questions: [07]
 i) Explain the principle of the gradient descent algorithm. Accompany your explanation with a diagram. Explain the use of all the terms and constants that you introduce and comment on the range of values that they can take. 03
 (ii) What's the trade-off between bias and variance? 04
 (b) Use two different distance measures to divide the given sample data in two clusters using k-means clustering algorithm. Use initial centroids as points 1 and point 4. Also, give your comments regarding the cluster formation. [07]

Subject	A	B
1	1.0	1.0
2	1.5	2.0
3	3.0	4.0
4	5.0	7.0
5	3.5	5.0
6	4.5	5.0
7	3.5	4.5

- Q.5 (a) How ensemble approach improves classification accuracy? Explain with suitable examples. [07]
 (b) Describe the working principal of Support Vector Machine with diagrams. [07]

OR

- Q.5 (a) Explain Ensemble Learning. [07]
 (b) Give the basic philosophy behind classifying data points based on non-linear SVM technique. Give pseudocode for the same. [07]