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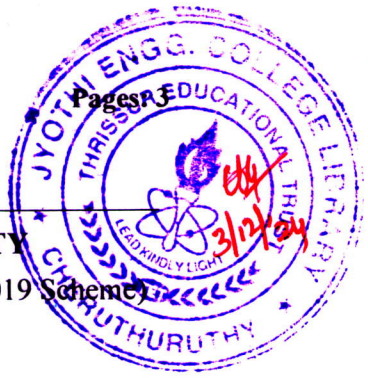



Reg No.:_____ Name:_____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

Fifth Semester B.Tech Degree (R, S) Examination November 2024 (2019 Scheme)

**Course Code: AMT 305**

**Course Name: INTRODUCTION TO MACHINE LEARNING**

Max. Marks: 100 Duration: 3 Hours

**PART A**

***(Answer all questions; each question carries 3 marks)*** Marks

| | | |
|---|---|---|
| 1 | Briefly describe the concept on Model selection and Generalization. | 3 |
| 2 | Discuss any 4 examples of Machine learning Applications. | 3 |
| 3 | Compare Forward selection and Backward selection. | 3 |
| 4 | Discuss the issues involved in decision tree learning. | 3 |
| 5 | What are the different methods for measuring classifier performance. | 3 |
| 6 | With suitable equations explain any two types of activation functions used in neural networks. | 3 |
| 7 | Describe the significance of kernel function in SVM. List any two kernel functions. | 3 |
| 8 | Explain the general MLE method for estimating the parameters of a probability distribution. | 3 |
| 9 | Describe boosting. What is the relation between Boosting and Ensemble learning? | 3 |
| 10 | Explain steps involved in Expectation Maximization algorithm. | 3 |

**PART B**

***(Answer one full question from each module, each question carries 14 marks)***

**Module -1**

| | | | |
|---|---|---|---|
| 11 | a) | Differentiate between supervised and unsupervised learning. Explain with suitable example. | 7 |
| | b) | Define VC dimension. How VC dimension is related with number of training examples used for learning? | 7 |

12 a) Explain the concept of PAC learning. Derive an expression for PAC learning in such a way that the selected function will have low generalized error. 10

b) Define the terms Hypothesis space and Version space. Illustrate with an example. 4

**Module -2**

13 a) Illustrate the idea of PCA for a two-dimensional data using suitable diagram. 14

14 a) Given all the previous patients I've seen (below are their symptoms and diagnosis. 8

| chills | runny nose | headache | fever | flu? |
|---|---|---|---|---|
| Y | N | Mild | Y | N |
| Y | Y | No | N | Y |
| Y | N | Strong | Y | Y |
| N | Y | Mild | Y | Y |
| N | N | No | N | N |
| N | Y | Strong | Y | Y |
| N | Y | Strong | N | N |
| Y | Y | Mild | Y | Y |

Do I believe that a patient with the following symptoms has the flu?

| chills | runny nose | headache | fever | flu? |
|---|---|---|---|---|
| Y | N | Mild | Y | ? |

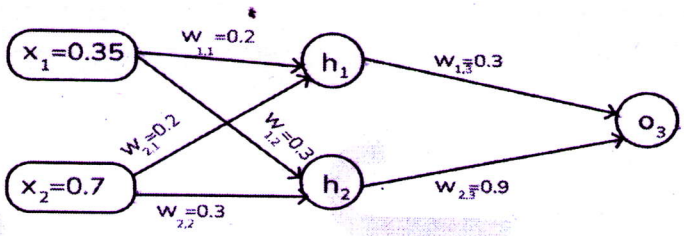
b) State ID3 algorithm, used for decision tree classification. 6

**Module -3**

15 a) What are ROC space and ROC curve in machine learning? In ROC space which point corresponds to perfect prediction, always positive prediction and always negative prediction? Why? 10

b) Briefly explain one way in which using TanH instead of sigmoid activations makes optimization easier? 4

16 Assume that the neurons have the sigmoid activation function to perform forward and backward pass on the network. And also assume that the actual output of y is 0.5 and the learning rate is 1. Now perform the back propagation using back propagation algorithm. 14




## Module -4

17 a) Compute the maximum likelihood estimate for the parameter λ in the Poisson distribution whose probability function is f(x)= $f(x) = \frac{e^{-\lambda}\lambda^{x}}{x!}$ — 8

b) Explain the general MLE method for estimating the parameters of a probability distribution. — 6

18 a) Describe the significance of soft margin hyper plane and optimal separating hyper plane and explain how they are computed. — 14

## Module -5

19 a) Describe EM algorithm for Gaussian Mixtures. — 8

b) Illustrate the strength and weakness of the K-means algorithm. — 6

20 a) Use K-means clustering to cluster the following data into two groups. Assume cluster centroid are $m_1$=2 and $m_2$= 4. The distance function used is Euclidian distance{2, 4, 10,12,3,20,30,11,25}. — 10

b) Write a note on similarity measures used in unsupervised learning. — 4

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