No. of Printed Pages : 4

Sl. No.

CE1.2-R4 : MACHINE LEARNING

DURATION : 03 Hours **MAXIMUM MARKS : 100**

Roll No. : | | | | | | |

Answer Sheet No. : | | | | | | |

Name of Candidate : _____ **; Signature of Candidate :** _____

INSTRUCTIONS FOR CANDIDATES :

- Carefully read the instructions given on Question Paper, Answer Sheet.
- Question Paper is in English language. Candidate has to answer in English Language only.
- **Question paper contains Seven questions. The Question No. 1 is compulsory. Attempt any FOUR Questions from Question No. 2 to 7.**
- **Parts of the same question should be answered together and in the same sequence.**
- **Questions are** to be answered in the **ANSWER SHEET** only, supplied with the Question Paper.
- **Candidate cannot leave the examination hall/ room without signing on the attendance sheet and handing over his/her Answer Sheet to the Invigilator. Failing in doing so, will amount to disqualification of Candidate in this Module/Paper.**
- After receiving the instruction to open the booklet and before answering the questions, the candidate should ensure that the Question Booklet is complete in all respects.

DO NOT OPEN THE QUESTION BOOKLET UNTIL YOU ARE TOLD TO DO SO.

1. (a) How is the function approximation referred to in machine learning ?

(b) What are hypothesis space (HS) and version space (VS)? Name the process that converts HS into VS.

(c) What are the benefits of active learning ?

(d) What is cross-validation in machine learning ?

(e) What is a decision tree ? Show how the if-else rules represent the decision tree using an example.

(f) Write the perceptron algorithm.

(g) What is the optimal hyperplane ?

(7x4)

2. (a) Consider the following database. A long, sweet, and yellow fruit belongs to which type ?

Type	Yellow	Sweet	Long	Total
Mango	350	450	0	800
Banana	400	300	350	1050
Other	50	100	50	200
Total	800	850	400	2050

(b) Explain support vector machine in detail. **(10+8)**

3. (a) Differentiate the generative and discriminative classifiers.

(b) Realize AND gate using perceptron.

(c) How do the perceptron and support vector machine independently tackle the linearly non-separable data ? **(5+8+5)**

4. (a) Every living thing is a plant or animal. David's dog is alive and it is not a plant. All the animals have hearts. Hence, prove that David's dog has a heart.

(b) Explain the concept of First-order Horn-clause Induction (FOHCI) in Inductive Logic Programming (ILP). Discuss its significance in machine learning.

(c) A company claims that the average weight of its protein bars is 50 grams. A consumer rights organization suspects that the actual average weight is less than 50 grams. To test this claim, they randomly sample 30 protein bars and find that the sample mean weight is 48.5 grams with a sample standard deviation of 3 grams. Using a significance level of 5% ($\alpha = 0.05$), determine whether the consumer rights organization has enough evidence to reject the company's claim. **(5+5+8)**

5. (a) Explain bagging and boosting in brief.

(b) Explain the null hypothesis and its characteristics with an example.

(c) Why is Quadratic Programming suitable for finding the maximum margin hyperplane in SVMs ? What are the advantages of Quadratic Programming in SVM ?

(8+5+5)

6. (a) Explain the candidate elimination algorithm.

(b) What is Machine Learning ? What are the main types ?

(c) What is Markov Hidden Network ? Differentiate Markov Networks and Bayesian Networks.

(6+4+8)

7. (a) Explain back propagation algorithm.

(b) Explain the learning curve. How does it improve the models ?

(c) What is Ensemble Learning ? Explain its main idea. What are the main advantages of ensemble methods over single machine learning models ?

(6+8+4)

- o 0 o -

SPACE FOR ROUGH WORK