

(3 Hours)

Total Marks: 80

N.B. : 1) Question No.1 is **compulsory**.2) Attempt any **THREE** from the remaining questions.

3) Figures to the right indicate full marks.

- Q1.** (a) What is Soft Margin Hyperplane? [5]
 (b) What is machine learning, and how does it differ from traditional programming? [5]
 (c) Write a note on Random Forest classifier [5]
 (d) What is gradient descent and how does it work? [5]
- Q2.** (a) Describe the key principles behind ensemble learning. Differentiate between bagging and boosting techniques. [10]
 (b) Discuss simple and model-based reflex agents with suitable diagram. [10]
- Q3.** (a) Find the weights using perceptron network for ANDNOT function (1 epoch). Use bipolar inputs and targets. The truth table of ANDNOT function is given below. Given, $\alpha = 1$, $\theta = 0$ and [10]
- $$y = f(y_{in}) = \begin{cases} 1 & \text{if } y_{in} > 0 \\ 0 & \text{if } -0 \leq y_{in} \leq 0 \\ -1 & \text{if } y_{in} < -0 \end{cases}$$

| x_1 | x_2 | t |
|-------|-------|-----|
| 1 | 1 | -1 |
| 1 | -1 | 1 |
| -1 | 1 | -1 |
| -1 | -1 | -1 |
- (b) Discuss Alpha-Beta search algorithm with a suitable example. [10]
- Q4.** (a) Compare Feature Extraction and Feature Selection techniques. Explain how dimensionality can be reduced using Principal Components Analysis. [10]
 (b) Explain AO* Algorithm with an example [10]
- Q5.** (a) Discuss in detail Grouping unlabeled items using k-means clustering with the help of a suitable example [10]
 (b) Discuss in detail Support Vector Machine (SVM) classifiers. How do they differ from traditional classification algorithms? [10]
- Q6.** (a) Explain Decision Tree classifier. How does information gain help in determining the best attribute to split on? [10]
 (b) What is Propositional logic and First order logic in AI? Discuss with suitable examples. [10]