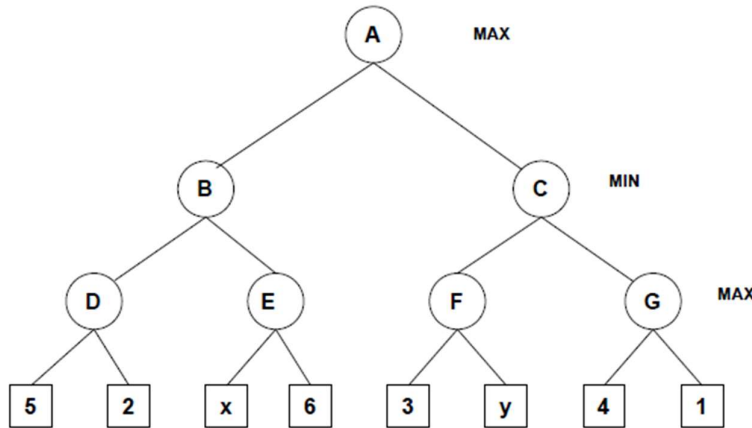


**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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- |  |     |           |         |
|--|-----|-----------|---------|
| <p>Q.1(a) Differentiate between Best-First Search and A* Search Algorithm. In your answer, compare the following aspects with appropriate examples where necessary:</p> <ol style="list-style-type: none"> <li>1. Evaluation functions used</li> <li>2. Use of heuristic</li> <li>3. Optimality and completeness</li> <li>4. Time and space complexity (in general)</li> <li>5. Applicability in informed search problems</li> </ol> | [5] | CO<br>CO1 | BL<br>4 |
| <p>Q.1(b) Consider the following game tree in which the first, second, and third levels correspond to MAX, MIN, and MAX agents, respectively. The leaf nodes represent the utility values resulting from terminal states of the game. Let x and y be symbolic values associated with two of these leaf nodes.</p>  | [5] | CO1       | 3       |



Using the alpha-beta pruning algorithm, determine the range of values for x and y such that:

- The right child of node E is pruned.
- The right child of node C is pruned.

Clearly explain your reasoning based on the principles of alpha-beta pruning.

- |   |     |     |   |
|---|-----|-----|---|
| <p>Q.2(a) Explain the key differences between Forward and Backward Reasoning. Illustrate each method with an example to highlight their working mechanisms and applications in logical inference or problem-solving.</p>  | [5] | CO2 | 2 |
| <p>Q.2(b) Consider the following sentences.</p> <ol style="list-style-type: none"> <li>(i) All people who are graduating are happy.</li> <li>(ii) All happy people smile.</li> <li>(iii) Someone is graduating</li> </ol> | [5] | CO2 | 3 |

Convert the above sentences into predicate logic and show by Resolution whether “someone is smiling”. Show each step clearly.

- Q.3(a) How Does a Planning-Based Agent Differ from a Search-Based Problem-Solving Agent? [2+3] CO3  
What is a Bayesian network, and how does it represent uncertainty?
- Q.3(b) Explain the STRIPS mechanism in Goal Stack Planning. What are the key components [5] CO3 2  
involved in STRIPS? Explain it with an example.
- Q.4(a) Why is underfitting called high bias and overfitting called high variance? What are the [2+3] CO4 1,2  
causes of overfitting in logistic regression and what Strategies Do You Follow to  
Overcome Overfitting in Logistic Regression?
- Q.4(b) What is the significance of K in K-NN? Consider the following table that provides the [1+4] CO4, 2,3  
name of fruits, along with their corresponding ranks for sweetness and sourness. The  
CO5  
fruit types are determined based on these ranks.

Fruit	Sweetness	Sourness	Fruit Type
Cherry	6	4	Sweet
Banana	9	1	Sweet
Grapes	8	2	Sweet
Watermelon	9	1	Sweet
Orange	3	7	Sour
Mango	10	0	Sweet
Lemon	1	9	Sour
Raspberry	2	8	Sour
Green Apple	2	8	Sour

Given the ranks of **sweetness** and **sourness** for **Strawberry** (Sweetness = 4, Sourness = 6), use the **K-Nearest Neighbors (K-NN)** algorithm to determine the **fruit type** of **Strawberry**. Use K=3 and Euclidian distance as distance metric.

- Q.5(a) Explain the concept of Gradient Descent and discuss its different types. What is the [3+2] CO4 2,4  
significance of learning rate in the Gradient Descent algorithm?
- Q.5(b) Which algorithm handles noise better: DBSCAN, Agglomerative or K-Means Clustering? [2+3] CO4, 2,3  
CO5  
Justify your answer.  
Given the data points A(3, 7), B(4, 6), C(5, 5), D(6, 4), E(7, 3), F(6, 2), G(7, 2) and  
H(8, 4), find the core points and outliers using DBSCAN. Take Eps = 2.5 and MinPts = 3.

:::::25/04/2025 M:::::