Lab 8: Min-Max Algorithm

# Definition of Min-Max Algorithm:

The Min-Max Algorithm is a recursive decision-making algorithm commonly used in two-player, turn-based games like Chess, Tic Tac Toe, and Checkers. It aims to minimize the possible loss for a worst-case scenario. When the opponent plays optimally, Min-Max helps in making the best move by assuming that both players will act in their best interest.

# Usage of Min-Max Algorithm:

- Game AI: Helps in making decisions in games like Chess and Tic Tac Toe.

- Decision Making: Used in situations where there are two competing agents.

- Artificial Intelligence: Basic model for adversarial games.

# Explanation of the Code:

1. A recursive function `min\_max` is defined which takes parameters: depth, node\_index, whether it's maximizing player's turn, values at leaf nodes, and target depth.

2. Base Case:

- If the depth equals target\_depth, it returns the value at that node (leaf node).

3. Recursive Case:

- If it's the maximizing player's turn, it returns the maximum value between its two children.

- If it's the minimizing player's turn, it returns the minimum value between its two children.

4. Example:

- We define a list `values` representing the leaf node values.

- The tree height (target\_depth) is set to 3.

- The `min\_max` function is called starting from depth 0 and node index 0 with the maximizing player's turn.

- The function computes the optimal value assuming both players play optimally.

# OUTPUT:

# 

# Conclusion:

The Min-Max Algorithm helps simulate the decision-making of both players to find the most optimal move. It is a basic yet powerful strategy used in adversarial games and has paved the way for more complex algorithms like Alpha-Beta Pruning.