SUPERIOR UNIVERSITY

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Section:AI(4A)

SUBJECT:PAI-Lab

SUBMITTED TO :Rasikh Ali

Lab task 4:

N-Queen Problem:

Title: Solving the Water Jug Problem Using Depth-First Search (DFS)

Introduction

The N-Queen problem is a famous puzzle in computer science and mathematics. It involves placing N queens on an N×N chessboard so that no two queens attack each other. This means that no two queens can be in the same row, column, or diagonal. The problem is often solved using backtracking, a technique that systematically searches for a solution by exploring possible placements and backtracking when a conflict is found.

Explanation of the Code

The given Python program uses backtracking to solve the N-Queen problem. Below is a step-by-step explanation of how it works:

Checking Safety (is_safe Function):

Before placing a queen in a particular position, the function is_safe checks whether the placement is valid.

It ensures that there is no other queen in the same row, upper diagonal, or lower diagonal.

Recursive Backtracking (solve Function):

This function places queens column by column.

If all queens are placed successfully, the function returns True.

If a valid position is found, the queen is placed, and the function moves to the next column.

If placing a queen in any row of a column leads to failure, the function backtracks and tries a different row.

Main Function (Nqueen):

Initializes an empty chessboard (2D list filled with zeros).

Calls the solve function to attempt placing queens.

If a solution is found, it prints the chessboard; otherwise, it prints a failure message.

Conclusion

This program efficiently solves the N-Queen problem using the backtracking approach. It systematically places queens and backtracks when necessary. This method ensures that all queens are placed safely, resulting in a valid solution for the given board size.

Output:

```
PS E:\PAI\pai lab> & "C:/Users/Muhammad ilyas/AppData/Local/Programs/Python/Python312/python.exe"
1 0 0 0 0 0 0 0
0 0 0 0 0 0 1 0
0 1 0 0 0 0 0 0
0 0 0 0 0 1 0 0
0 0 0 0 0 0 0 1
0 0 1 0 0 0 0 0
0 0 0 0 1 0 0 0
0 0 0 1 0 0 0 0
PS E:\PAI\pai lab>
```