IMPLEMENTATION OF N-QUEEN PROBLEM

USING BACKTRACKING ALGORITHM

AIM

To Implement N-Queen's problem by using backtracking algorithm using python.

ALGORITHM

1. Initialize board: Create an N× N chessboard and set all cells to empty.
2. Start at first column: Begin placing queens in the first column.
3. Place queen: Attempt to place a queen in the current column, starting from the first row.
4. Check safety: Before placing, check if the cell is safe (no other queen in the same row, column, or diagonal).
5. Place if safe: If the position is safe, place the queen in that cell.
6. Move to next column: Recursively attempt to place a queen in the next column.
7. Backtrack if needed: If no safe position is found in a column, remove the previously placed queen (backtrack) and try the next row in the previous column.
8. Repeat steps 3– 7: Continue until all queens are placed successfully or all possibilities are exhausted.
9. Solution found: Once N queens are placed safely, stop recursion and record this arrangement as a solution.
10. Display solution: Print the board showing the positions of the N queens.

PROGRAM

N-Queens Problem

```
def is_safe(board, row, col, N):
    # Check this row on the left
    for i in range(col):
        if board[row][i] == 1:
            return False
    # Check upper diagonal on left side
    for i, j in zip(range(row, -1, -1), range(col, -1, -1)):
        if board[i][j] == 1:
            return False
    # Check lower diagonal on left side
    for i, j in zip(range(row, N, 1), range(col, -1, -1)):
        if board[i][j] == 1:
            return False
    return True


def solve_nqueens_one_solution(board, col, N):
    if col >= N:
        return True  # Found one solution
```

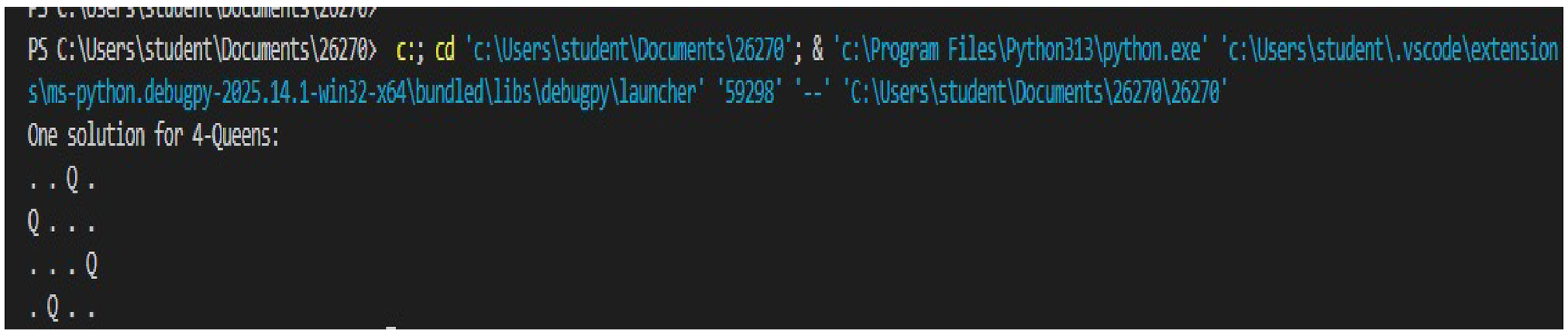
```
    for row in range(N):
        if is_safe(board, row, col, N):
            board[row][col] = 1
            if solve_nqueens_one_solution(board, col + 1, N):
                return True
            board[row][col] = 0  # backtrack
        return False


def print_solution(board, N):
    for row in board:
        print(" ".join('Q' if x else '.' for x in row))


# Example: Solve 4-Queens
N = 4
board = [[0]*N for _ in range(N)]


if solve_nqueens_one_solution(board, 0, N):
    print(f"One solution for {N}-Queens:")
    print_solution(board, N)
else:
    print(f"No solution exists for {N}-Queens")
```

OUTPUT


PS C:\Users\student\Documents\26270> c:; cd 'c:\Users\student\Documents\26270'; & 'c:\Program Files\Python313\python.exe' 'c:\Users\student\.vscode\extensions\ms-python.debugpy-2025.14.1-win32-x64\bundled\libs\debugpy\launcher' '59298' '--' 'C:\Users\student\Documents\26270\26270'
One solution for 4-Queens:
. . Q .
Q . . .
. . . Q
. Q . .

RESULT

Thus, the Implementation of N-queen problem using backtracking algorithm using Python was successfully executed and output was verified.