BHARATIYA VIDYA BHAVAN'S

SARDAR PATEL INSTITUTE OF TECHNOLOGY

MUNSHI NAGAR, ANDHERI (WEST), MUMBAI – 400 058.

(Autonomous College Affiliated to University of Mumbai)

MASTER OF COMPUTER APPLICATIONS

Class : F.Y.MCA   Semester : II   Academic Year : 2024-25

Course Name : Design and Analysis of Algorithm MC507

Subject Incharge : Prof.Nikhita Mangaonkar

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EXPERIMENT NO: 06

EXPERIMENT TITLE: To implement NQueens problem
5.1 To implement NQueens problem.
5.2 To Understand the backtracking technique.

Objective:
1.To Implement NQueens problem
2.To Understand the backtracking technique

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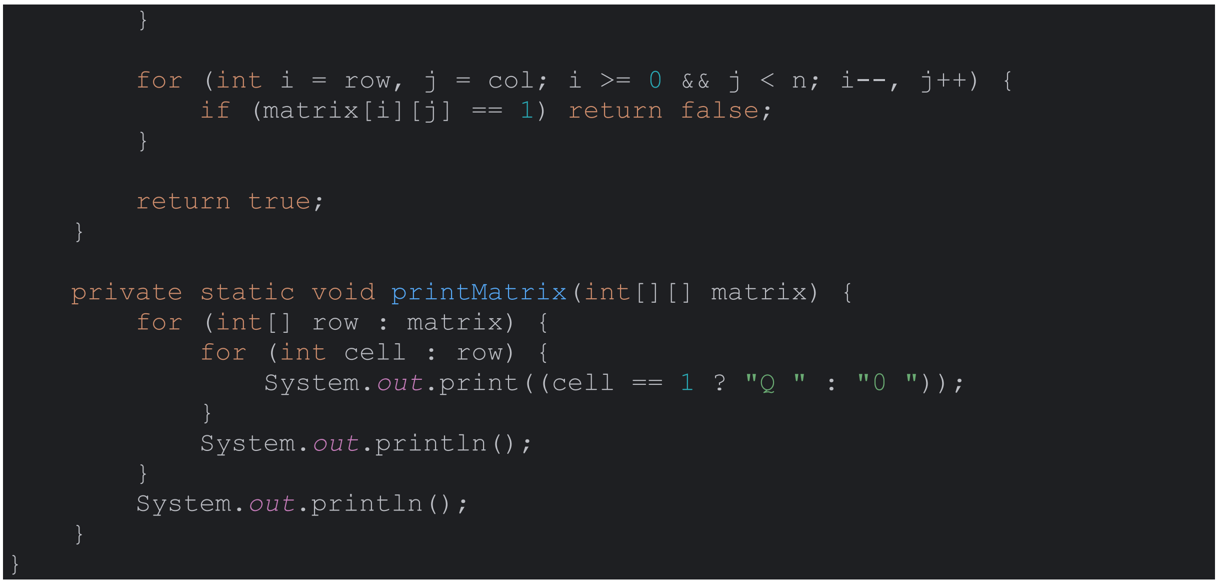
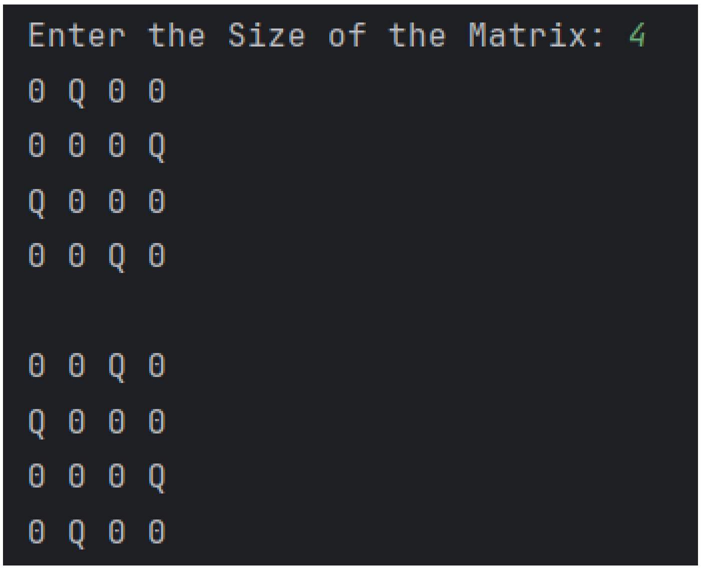
Program code: -

```
import java.util.Scanner;

public class NQueens {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter the Size of the Matrix: ");
        int matrixSize = sc.nextInt();
        int[][] matrix = new int[matrixSize][matrixSize];

        if (!makeNQueen(matrix, 0)) {
            System.out.println("No solution exists.");
        }

        sc.close();
    }

    private static boolean makeNQueen(int[][] matrix, int row) {
        int n = matrix.length;

        if (row >= n) {
            printMatrix(matrix);
            return true;
        }

        boolean result = false;

        for (int col = 0; col < n; col++) {
            if (isSafeToPlace(matrix, row, col)) {
                matrix[row][col] = 1;
                result = makeNQueen(matrix, row + 1) || result;
                matrix[row][col] = 0;
            }
        }

        return result;
    }

    private static boolean isSafeToPlace(int[][] matrix, int row, int col)
{
        int n = matrix.length;

        for (int i = 0; i < row; i++) {
            if (matrix[i][col] == 1) return false;
        }

        for (int i = row, j = col; i >= 0 && j >= 0; i--, j--) {
            if (matrix[i][j] == 1) return false;
```



```
        }

        for (int i = row, j = col; i >= 0 && j < n; i--, j++) {
            if (matrix[i][j] == 1) return false;
        }

        return true;
    }

    private static void printMatrix(int[][] matrix) {
        for (int[] row : matrix) {
            for (int cell : row) {
                System.out.print((cell == 1 ? "Q " : "0 "));
            }
            System.out.println();
        }
        System.out.println();
    }
}
```

Output:



```
Enter the Size of the Matrix: 4
0 Q 0 0
0 0 0 Q
Q 0 0 0
0 0 Q 0


0 0 Q 0
Q 0 0 0
0 0 0 Q
0 Q 0 0
```

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Conclusion:

In this experiment, we solved the N-Queens problem using backtracking. The program places queens on the board so that they don’t attack each other. If a safe position is found, the queen is placed; otherwise, it backtracks and tries another position. This helped us understand how backtracking works in solving problems step by step. It was a good way to learn how to use recursion for such problems.