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SUBJECT	DAA
EXPERIMENT NO:	07
AIM:	To implement Backtracking Problem(N Queen Problem)

Algorithm:	• Backtracking Algorithm:
	
	function solveNQueens(board, col, n):
	  if col >= n:
	  print board
	  return true
	  for row from 0 to n-1:
	  if isSafe(board, row, col, n):
	  board[row][col] = 1
	  if solveNQueens(board, col+1, n):
	  return true
	  board[row][col] = 0
	  return false
	
	function isSafe(board, row, col, n):
	  for i from 0 to col-1:
	  if board[row][i] == 1:
	  return false
	  for i,j from row-1, col-1 to 0, 0 by -1:
	  if board[i][j] == 1:
	  return false
	  for i,j from row+1, col-1 to n-1, 0 by 1, -1:
	  if board[i][j] == 1:
	  return false
	  return true
	
	board = empty NxN chessboard
	solveNQueens(board, 0, N)

Code:	

```
#include <stdio.h>
#include <stdbool.h>
void printSolution(int n, int board[n][n]) {
    for (int i = 0; i < n; i++) {
        for (int j = 0; j < n; j++) {
            printf("%c ", board[i][j] ? 'Q' : '.');
        }
        printf("\n");
    }
    printf("\n");
}
bool isSafe(int n, int board[n][n], int row, int col) {
    int i, j;

    for (i = 0; i < col; i++) {
        if (board[row][i]) {
            return false;
        }
    }
    for (i = row, j = col; i >= 0 && j >= 0; i--, j--) {
        if (board[i][j]) {
            return false;
        }
    }
    for (i = row, j = col; j >= 0 && i < n; i++, j--) {
        if (board[i][j]) {
            return false;
        }
    }
    return true;
}
void solveNQueensUtil(int n, int board[n][n], int col) {
     if (col == n) {
        printSolution(n, board);
        return;
    }
    for (int i = 0; i < n; i++) {
        if (isSafe(n, board, i, col)) {
            board[i][col] = 1;
```

```
            solveNQueensUtil(n, board, col+1);
            board[i][col] = 0;
        }
    }
}
void solveNQueens(int n) {
    int board[n][n];
    for (int i = 0; i < n; i++) {
        for (int j = 0; j < n; j++) {
            board[i][j] = 0;
        }
    }
    solveNQueensUtil(n, board, 0);
}
int main() {
    int n;
    printf("Enter Number of Queens: ");
    scanf("%d",&n);
    solveNQueens(n);
    return 0;
}
```

Output:

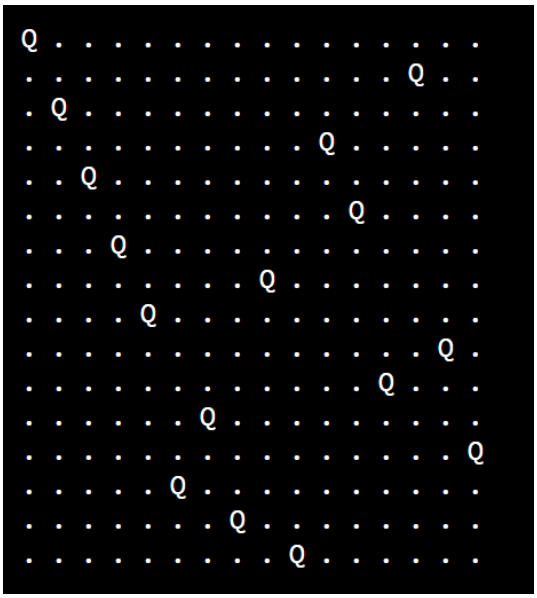
```
PS C:\Users\prith\OneDrive\Desktop\Semester 4\DAA Practicals\Exp7> gcc backtrack.c
PS C:\Users\prith\OneDrive\Desktop\Semester 4\DAA Practicals\Exp7> ./a.exe
Enter Number of Queens: 16
```

```
Enter Number of Queens: 16
Q . . . . . . . . . . . . . . . .
. . . Q . . . . . . . . . . . . .
. Q . . . . . . . . . . . . . . .
. . . . . Q . . .
. . Q . . . . . . . . . . . . . .
. . . . . Q . . . . . .
. . . . . Q . . . .
. . . . . Q .
. . . . . Q . . . . . . . . . .
. . . . . Q
. . . . . Q . .
. . . . . Q . . . . . .
. . . . Q . . . . . .
. . . . . Q . . . . . .
. . . . . Q . . . . . .
. . . . . Q . . . . . .

Q . . . . . . . . . . . . . . . .
. . . Q . . . . . . . . . . . . .
. Q . . . . . . . . . . . . . . .
. . . . . Q . . .
. . Q . . . . . . . . . . . . . .
. . . . . Q . . . . . .
. . . . . Q . .
. . . . . Q . . . .
. . . . . Q .
. . . . . Q . . . . . .
. . . . . Q
. . . . . Q . . . . . .
. . . . Q . . . . . .
. . . . . Q . . . . . .
. . . . . Q . . . . . .
. . . . . Q . . . . . .
```

```
Q . . . . . .
. . . . . Q . .
. Q . . . . . .
. . . . . Q . .
. . Q . . . . .
. . . . . Q . .
. . . Q . . . .
. . . . . Q . .
. . . . Q . . .
. . . . . Q
. . . . . Q . .
. . . . . Q . .
. . . . . Q .
. . . . . Q . .
. . . . . Q . .
. . . . . Q . .

Q . . . . . .
. . . . . Q . .
. Q . . . . . .
. . . . . Q . .
. . Q . . . . .
. . . . . Q . .
. . . Q . . . .
. . . . . Q
. . . . Q . . .
. . . . . Q . .
. . . . . Q . .
. . . . . Q . .
. . . . . Q .
. . . . . Q . .
. . . . . Q . .
. . . . . Q . .
```

```
Q . . . . . . . . . . . . . . .
. . . . . . . . . . . . . Q . .
. Q . . . . . . . . . . . . . .
. . . . . . . . . . Q . . . . .
. . Q . . . . . . . . . . . . .
. . . . . . . . . . . Q . . . .
. . . Q . . . . . . . . . . . .
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. . . . Q . . . . . . . . . . .
. . . . . . . . . . . . . . Q .
. . . . . . . . . . . . Q . . .
. . . . . . Q . . . . . . . . .
. . . . . . . . . . . . . . . Q
. . . . . Q . . . . . . . . . .
. . . . . . . Q . . . . . . . .
. . . . . . . . . Q . . . . . .
```

Conclusion:	Thus we have implemented Backtracking Problem(N Queen Problem) and also generalized it for any number of queens and boards such that no two queen are in same diagonal column or row.