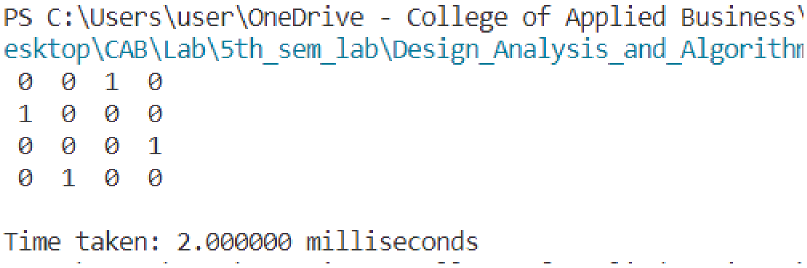
Experiment 18

Write a program to implement the dynamic algorithm to solve the Zero-one Knapsack problem.

Program:-

```
#include <stdio.h>
#include <stdlib.h>
#include <time.h>
#define N 4
void printSolution(int board[N][N]) {
  for (int i = 0; i < N; i++) {
    for (int j = 0; j < N; j++)
      printf(" %d ", board[i][j]);
    printf("\n");
  }    }
int isSafe(int board[N][N], int row, int col) {
  int i, j;
  for (i = 0; i < col; i++)
    if (board[row][i])
      return 0;
  for (i=row, j=col; i>=0 && j>=0; i--, j--)
    if (board[i][j])
      return 0;
  for (i=row, j=col; j>=0 && i<N; i++, j--)
    if (board[i][j])
      return 0;
  return 1;
}
int solveNQUtil(int board[N][N], int col) {
  if (col >= N)
    return 1;
  for (int i = 0; i < N; i++) {
        if (isSafe(board, i, col)) {
            board[i][col] = 1;
            if (solveNQUtil(board, col + 1))
                return 1;
            board[i][col] = 0;
        }  }
    return 0;
}
int solveNQ() {
    int board[N][N] = { {0, 0, 0, 0},
                        {0, 0, 0, 0},
                        {0, 0, 0, 0},
                        {0, 0, 0, 0} };
    if (solveNQUtil(board, 0) == 0) {
        printf("Solution does not exist");
        return 0;
    }
    printSolution(board);
    return 1;
}
int main() {
    double time;
    clock_t start, end;
    start = clock();
    solveNQ();
    end = clock();
    time = ((double)(end - start) * 1000) / CLOCKS_PER_SEC;
    printf("\nTime taken: %lf milliseconds\n", time);
    return 0;
}
```

Output:



```
PS C:\Users\user\OneDrive - College of Applied Business\
esktop\CAB\Lab\5th_sem_lab\Design_Analysis_and_Algorithm
 0  0  1  0
 1  0  0  0
 0  0  0  1
 0  1  0  0

Time taken: 2.000000 milliseconds
```

Conclusion:

This experiment had been conducted in a 64-bit system with 16 GB RAM and Processor 12th Gen Intel(R) Core (TM) i5-12500H 3.10 GHz. The algorithm was implemented in C programming language in Visual Studio Code 1.85.1 Code Editor. The time taken by this algorithm for 4-queen problem is 2 milliseconds.. The running time is analyzed as O(N!) which means there is not the most efficient solution for the N-Queens problem.