RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Lab Report 8

Course Code: *CSE 2202*

Course Title: *Sessional Based on CSE 2201.*

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Problem Statement: Using backtracking, solve the N queens problem. For any N taken as input, your code should find out the goal nodes as well as the bounding nodes (from where no more nodes are checked along that path and backtracking occurred). Each state/node is represented by the following style.

Code:

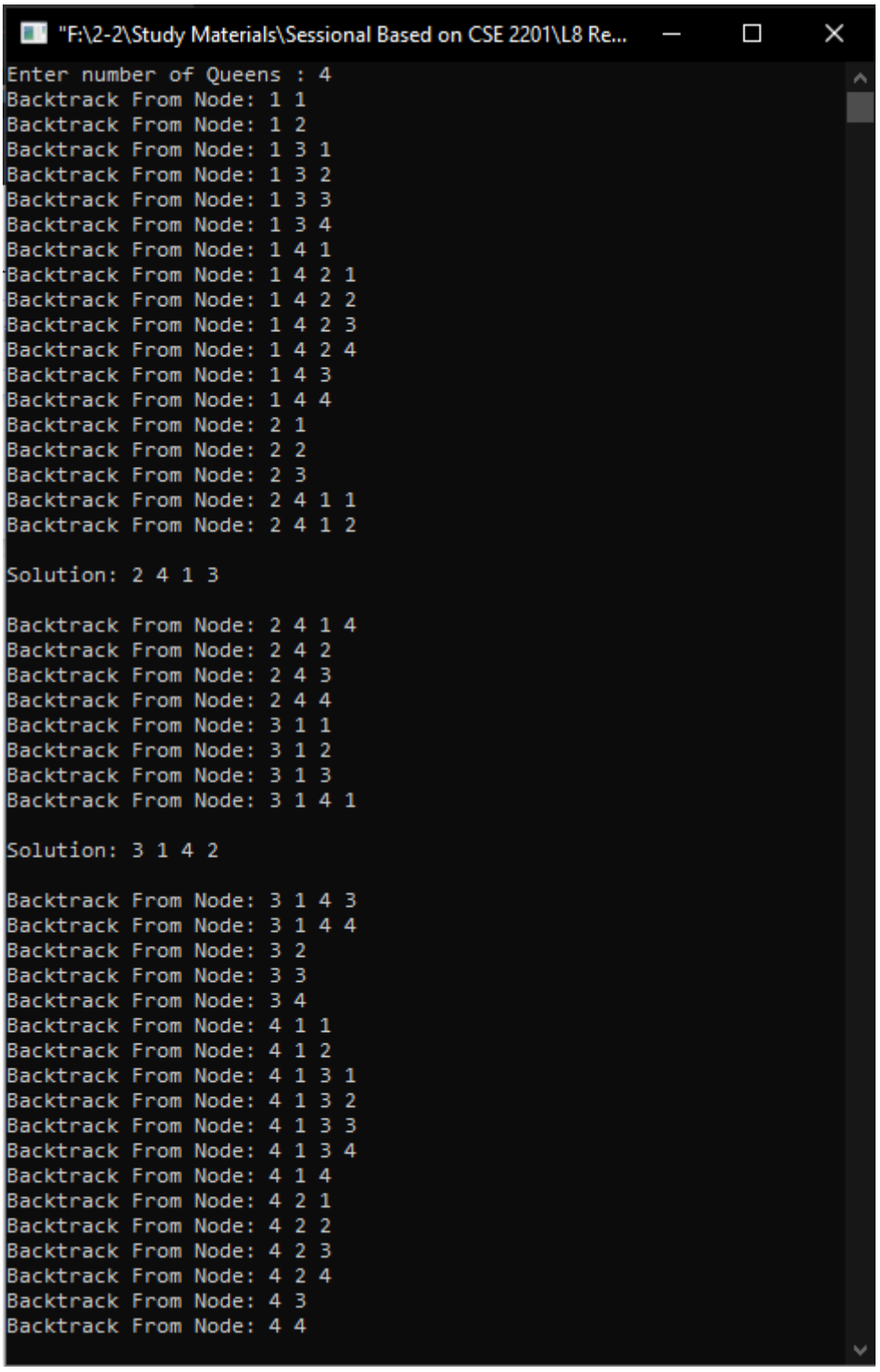
```
#include <bits/stdc++.h>
using namespace std;
bool isSafetoPlaceQueen(vector<vector<int>> board, int row, int col)
{
   int n = board.size();
   vector<int> nodes;
   for (int i = 0; i < n; i++)
   {
      for (int j = 0; j < n; j++)
      {
         if(i == row && j == col)
         {
            nodes.push_back(col+1);
         }
         if (board[i][j] == 1)
            nodes.push_back(j + 1);
      }
   }
   for (int i = 0; i < row; i++)
      if (board[i][col])
      {
         cout<<"Backtrack From Node: ";
         for(int j = 0 ; j < nodes.size() ; j++)
         {
            cout<<nodes[j]<<" ";
         }
         cout<<endl;
         return false;
```

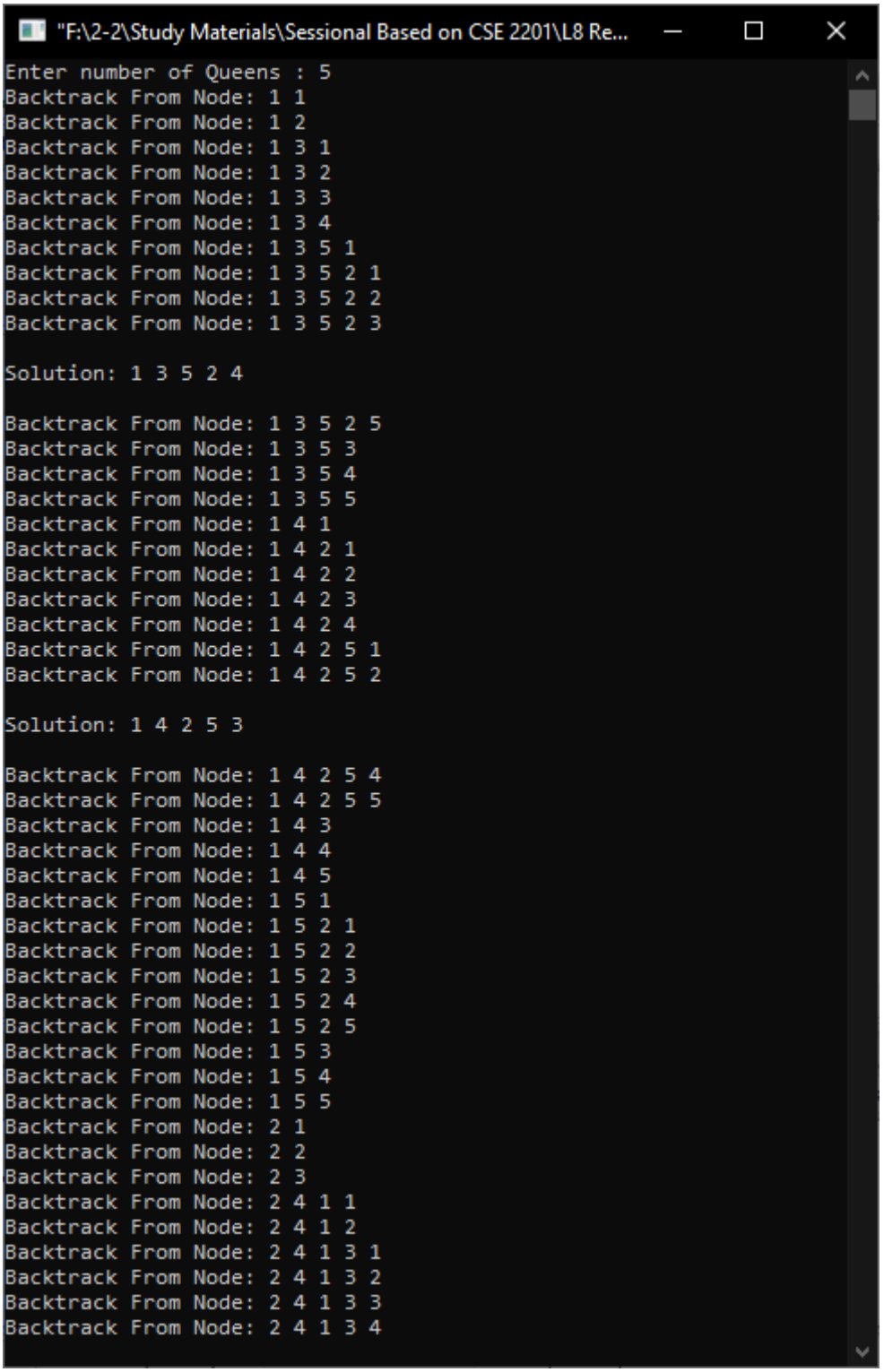
```
        }
    for (int i = row, j = col; i >= 0 && j >= 0; i--, j--)
        if (board[i][j])
        {
            cout<<"Backtrack From Node: ";
            for(int j = 0 ; j < nodes.size() ; j++)
            {
                cout<<nodes[j]<<" ";
            }
            cout<<endl;
            return false;
        }
    for (int i = row, j = col; i >= 0 && j < n; i--, j++)
        if (board[i][j])
        {
            cout<<"Backtrack From Node: ";
            for(int j = 0 ; j < nodes.size() ; j++)
            {
                cout<<nodes[j]<<" ";
            }
            cout<<endl;
            return false;
        }

    return true;
}
void getSolution(vector<vector<int> >& board, int row)
{
    int n = board.size();
    if (row == n)
    {
        vector<int> nodes;
        for (int i = 0; i < n; i++)
        {
```

```
            for (int j = 0; j < n; j++)
            {
                if (board[i][j] == 1)
                    nodes.push_back(j + 1);
            }
        }
        cout<<endl<<"Solution: ";
        for(int i = 0 ; i < nodes.size() ; i++)
        {
            cout<<nodes[i]<<" ";
        }
        cout<<endl<<endl;
        return ;
    }
    for (int col = 0; col < n; col++)
    {
        if (isSafetoPlaceQueen(board, row, col))
        {
            board[row][col] = 1;
            getSolution(board, row + 1);
            board[row][col] = 0;
        }
    }
    return ;
}
int main()
{
    int n;
    cout<<"Enter number of Queens : ";
    cin>>n;
    vector<vector<int> > board(n, vector<int>(n, 0));
    getSolution(board, 0);
    return 0;
}
```

Output:


"F:\2-2\Study Materials\Sessional Based on CSE 2201\L8 Re...
Enter number of Queens : 4
Backtrack From Node: 1 1
Backtrack From Node: 1 2
Backtrack From Node: 1 3 1
Backtrack From Node: 1 3 2
Backtrack From Node: 1 3 3
Backtrack From Node: 1 3 4
Backtrack From Node: 1 4 1
Backtrack From Node: 1 4 2 1
Backtrack From Node: 1 4 2 2
Backtrack From Node: 1 4 2 3
Backtrack From Node: 1 4 2 4
Backtrack From Node: 1 4 3
Backtrack From Node: 1 4 4
Backtrack From Node: 2 1
Backtrack From Node: 2 2
Backtrack From Node: 2 3
Backtrack From Node: 2 4 1 1
Backtrack From Node: 2 4 1 2
Solution: 2 4 1 3
Backtrack From Node: 2 4 1 4
Backtrack From Node: 2 4 2
Backtrack From Node: 2 4 3
Backtrack From Node: 2 4 4
Backtrack From Node: 3 1 1
Backtrack From Node: 3 1 2
Backtrack From Node: 3 1 3
Backtrack From Node: 3 1 4 1
Solution: 3 1 4 2
Backtrack From Node: 3 1 4 3
Backtrack From Node: 3 1 4 4
Backtrack From Node: 3 2
Backtrack From Node: 3 3
Backtrack From Node: 3 4
Backtrack From Node: 4 1 1
Backtrack From Node: 4 1 2
Backtrack From Node: 4 1 3 1
Backtrack From Node: 4 1 3 2
Backtrack From Node: 4 1 3 3
Backtrack From Node: 4 1 3 4
Backtrack From Node: 4 1 4
Backtrack From Node: 4 2 1
Backtrack From Node: 4 2 2
Backtrack From Node: 4 2 3
Backtrack From Node: 4 2 4
Backtrack From Node: 4 3
Backtrack From Node: 4 4


"F:\2-2\Study Materials\Sessional Based on CSE 2201\L8 Re...
Enter number of Queens : 5
Backtrack From Node: 1 1
Backtrack From Node: 1 2
Backtrack From Node: 1 3 1
Backtrack From Node: 1 3 2
Backtrack From Node: 1 3 3
Backtrack From Node: 1 3 4
Backtrack From Node: 1 3 5 1
Backtrack From Node: 1 3 5 2 1
Backtrack From Node: 1 3 5 2 2
Backtrack From Node: 1 3 5 2 3
Solution: 1 3 5 2 4
Backtrack From Node: 1 3 5 2 5
Backtrack From Node: 1 3 5 3
Backtrack From Node: 1 3 5 4
Backtrack From Node: 1 3 5 5
Backtrack From Node: 1 4 1
Backtrack From Node: 1 4 2 1
Backtrack From Node: 1 4 2 2
Backtrack From Node: 1 4 2 3
Backtrack From Node: 1 4 2 4
Backtrack From Node: 1 4 2 5 1
Backtrack From Node: 1 4 2 5 2
Solution: 1 4 2 5 3
Backtrack From Node: 1 4 2 5 4
Backtrack From Node: 1 4 2 5 5
Backtrack From Node: 1 4 3
Backtrack From Node: 1 4 4
Backtrack From Node: 1 4 5
Backtrack From Node: 1 5 1
Backtrack From Node: 1 5 2 1
Backtrack From Node: 1 5 2 2
Backtrack From Node: 1 5 2 3
Backtrack From Node: 1 5 2 4
Backtrack From Node: 1 5 2 5
Backtrack From Node: 1 5 3
Backtrack From Node: 1 5 4
Backtrack From Node: 1 5 5
Backtrack From Node: 2 1
Backtrack From Node: 2 2
Backtrack From Node: 2 3
Backtrack From Node: 2 4 1 1
Backtrack From Node: 2 4 1 2
Backtrack From Node: 2 4 1 3 1
Backtrack From Node: 2 4 1 3 2
Backtrack From Node: 2 4 1 3 3
Backtrack From Node: 2 4 1 3 4