

## DESIGN AND ANALYSIS OF ALGORITHMS LAB ( PCS-409 )

### WEEK 6

1. Given a (directed/undirected) graph, design an algorithm and implement it using a program to find if a path exists between two given vertices or not. (Hint: use DFS)

```
#include <iostream>
#include <vector>
#include <fstream>
#include<iostream>
using namespace std;

//dfs
bool dfs(vector<vector<int>>&adj,vector<int>&visited,int source,int destination){
    if(visited[source]==1) return false;
    visited[source] = 1;
    for(int i:adj[source]){
        if(i==destination) return true;
        if(visited[i]!=1){
            if(dfs(adj,visited,i,destination)) return true;
        }
    }
    return false;
}

int main() {
    // Open input and output files
    ifstream fin("input.txt");
    ofstream fout("output.txt");

    // Check if files are opened successfully
    if (!fin.is_open() || !fout.is_open()) {
        cout << "Error occurred while opening files.\n";
        return 0;
    }

    //input graph
    int vertices,edges;
```

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```
fin>>vertices>>edges;
vector<vector<int>>>adj(vertices);
vector<int>visited(vertices);
for(int i=0;i<edges;i++){
    int u,v;
    fin>>u>>v;
    adj[v].push_back(u);
    adj[u].push_back(v);
}
int source,destination;
fin>>source>>destination;
if(dfs(adj,visited,source,destination)){
    fout<<"Yes Path Exists\n";
}
else{
    fout<<"No Such Path Exists\n";
}

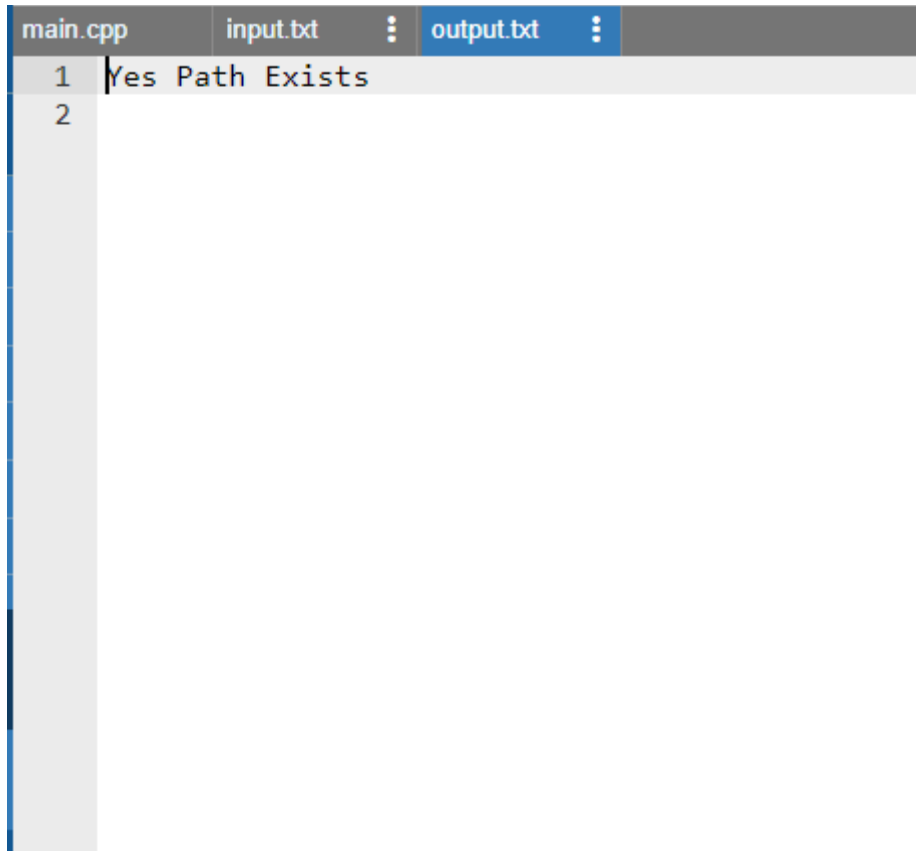
// Close input and output files

fin.close();
fout.close();
}
```

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main.cpp	input.txt	output.txt
1	5 7	
2	0 1	
3	0 2	
4	1 2	
5	1 3	
6	1 4	
7	2 3	
8	3 4	
9	0 4	

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The image shows a screenshot of a code editor with four tabs: 'main.cpp', 'input.txt', 'output.txt', and an unlabeled tab. The 'main.cpp' tab is active, displaying a C++ program. The program consists of two lines: a comment '1 Yes Path Exists' and a line '2'. The 'output.txt' tab is also visible, showing the output of the program. The output is '1 Yes Path Exists' on the first line and '2' on the second line. The code editor has a light gray background and a blue vertical scrollbar on the left.

```
1 1 Yes Path Exists
2 2
```

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2 . Given a graph, design an algorithm and implement it using a program to find if a graph is bipartite or not. (Hint: use BFS)

```
#include <vector>
#include <fstream>
#include<iostream>
#include<queue>
using namespace std;

                                                                    //bfs

bool bfs(vector<vector<int>>&graph,int vertices){
    vector<int>color(vertices,-1);
    queue<int>q;
    color[0]=0;
    q.push(0);
    while(q.empty()==false){
        int node = q.front();
        q.pop();
        for(auto i:graph[node]){
            if(color[i]==-1){
                q.push(i);
                color[i] = !color[node];
            }
            else if(color[i] ==color[node]){
                return false;
            }
        }
    }
    return true;
}

int main() {

                                                                    // Open input and output files

    ifstream fin("input.txt");
```

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```
ofstream fout("output.txt");

// Check if files are opened successfully

if (!fin.is_open() || !fout.is_open()) {
    cout << "Error occurred while opening files.\n";
    return 0;
}

//input graph

int vertices,edges;
fin>>vertices>>edges;
vector<vector<int>>adj(vertices);

for(int i=0;i<edges;i++){
    int u,v;
    fin>>u>>v;
    adj[v].push_back(u);
    adj[u].push_back(v);
}

if(bfs(adj,vertices)){
    fout<<"Yes Bipartite\n";
}
else{
    fout<<"Not Bipartite\n";
}

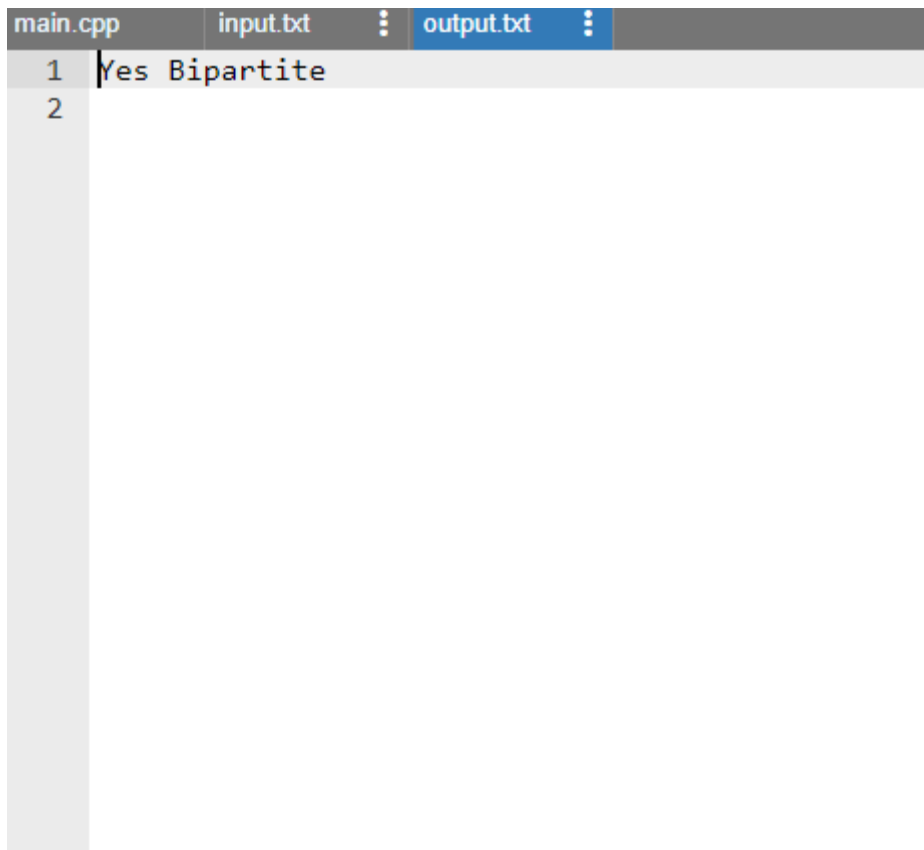
// Close input and output files

fin.close();
fout.close();
}
```

## DESIGN AND ANALYSIS OF ALGORITHMS LAB ( PCS-409 )

main.cpp	input.txt	:	output.txt	:	
1	8 8				
2	0 1				
3	1 2				
4	2 3				
5	3 4				
6	4 6				
7	6 7				
8	1 7				
9	4 5				

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The screenshot shows a code editor with three tabs: 'main.cpp', 'input.txt', and 'output.txt'. The 'output.txt' tab is active and displays the text 'Yes Bipartite'. The editor has a light gray background and a dark gray border.

```
main.cpp  input.txt  output.txt
1  Yes Bipartite
2
```



## DESIGN AND ANALYSIS OF ALGORITHMS LAB ( PCS-409 )

3 . Given a directed graph, design an algorithm and implement it using a program to find whether cycle exists in the graph or not.

```
#include <vector>
#include <fstream>
#include<iostream>
#include<queue>
using namespace std;

                                                                    //bfs

bool bfs(vector<vector<int>>&graph,int vertices){
    vector<int>visited(vertices,-1);
    queue<pair<int,int>>q;
    visited[0]=1;
    q.push({0,-1});
    while(q.empty()!==false){
        int node = q.front().first;
        int parent = q.front().second;
        q.pop();
        for(auto i:graph[node]){
            if(visited[i]==-1){
                q.push({i,node});
                visited[i] = !visited[node];
            }
            else if(i!=parent) return true;
        }
    }
    return false;
}

int main() {
                                                                    // Open input and output files

    ifstream fin("input.txt");
    ofstream fout("output.txt");
    // Check if files are opened successfully
    if (!fin.is_open() || !fout.is_open()) {
```

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```
    cout << "Error occurred while opening files.\n";
    return 0;
}

//input graph

int vertices,edges;
fin>>vertices>>edges;
vector<vector<int>>adj(vertices);

for(int i=0;i<edges;i++){
    int u,v;
    fin>>u>>v;
    adj[v].push_back(u);
    adj[u].push_back(v);
}
if(bfs(adj,vertices)){
    fout<<"Yes Cycle Exists\n";
}
else{
    fout<<"No Cycle Exists\n";
}

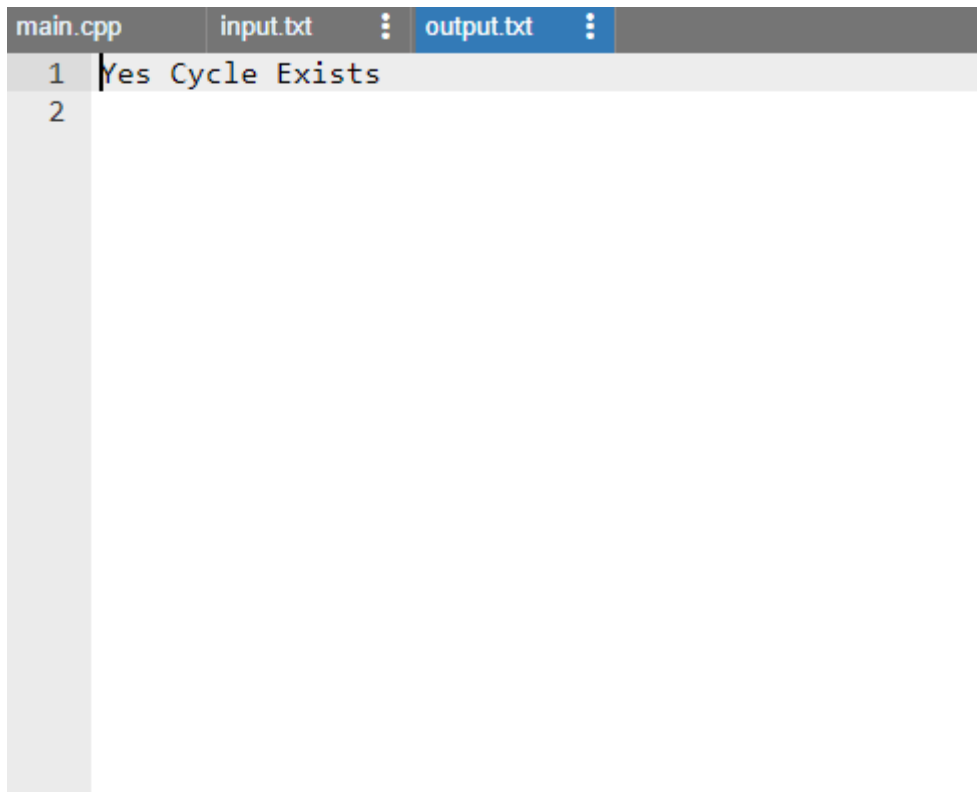
// Close input and output files

fin.close();
fout.close();
}
```

## DESIGN AND ANALYSIS OF ALGORITHMS LAB ( PCS-409 )

```
main.cpp  input.txt  ⋮  output.txt  ⋮  
1  8 8  
2  0 1  
3  1 2  
4  2 3  
5  3 4  
6  4 6  
7  6 7  
8  1 7  
9  4 5 |
```

## DESIGN AND ANALYSIS OF ALGORITHMS LAB ( PCS-409 )



The screenshot shows a code editor with three tabs: 'main.cpp', 'input.txt', and 'output.txt'. The 'output.txt' tab is active and displays the output of the program. The output consists of two lines: '1 Yes Cycle Exists' and '2'. The code in 'main.cpp' is not fully visible, but it appears to be a C++ program that checks for a cycle in a graph.

```
main.cpp  input.txt  output.txt
1 Yes Cycle Exists
2
```