**Assignment 1**

**Parallel BFS**

#include<iostream>

#include<bits/stdc++.h>

#include<omp.h>

using namespace std;

vector<bool> v;

vector<vector<int>> g;

void bfsTraversal(int b)

{

queue<int> q; //Declare a queue to store all the nodes connected to b

q.push(b); //Insert b to queue

v[b]=true; //mark b as visited

cout<<"\nThe BFS Traversal is: ";

double start=omp\_get\_wtime();

while(!q.empty())

{

int a = q.front();

q.pop(); //delete the first element form queue

#pragma omp parallel

for(auto j=g[a].begin();j!=g[a].end();j++)

{

if (!v[\*j])

{

v[\*j] = true;

q.push(\*j);

}

}

cout<<a<<" ";

}

double end=omp\_get\_wtime();

double time=end-start;

cout<<"\n\nTime taken => "<<time<<endl;

}

void makeEdge(int a, int b)

{

g[a].push\_back(b); //an edge from a to b (directed graph)

}

int main()

{

omp\_set\_num\_threads(4);

int n,e;

cout<<"Consider first vertex => 0"<<endl;

cout<<"\nEnter the number of vertices: ";

cin >> n;

cout<<"\nEnter the number of edges: ";

cin>>e;

v.assign(n, false);

g.assign(n, vector<int>());

int a, b, i;

cout << "\nEnter the edges with source and target vertex: "<<endl;

for(i=0;i<e;i++)

{

cin>>a>>b;

makeEdge(a, b);

}

for (i=0;i<n;i++)

{

if (!v[i]) //if the node i is unvisited

{

bfsTraversal(i);

}

}

return 0;

}

**Output –**

Consider first vertex => 0

Enter the number of vertices: 6

Enter the number of edges: 8

Enter the edges with source and target vertex:

0 1

0 2

1 3

1 4

2 4

3 5

4 5

3 4

The BFS Traversal is: 0 1 2 3 4 5

Time taken => 0.00199986