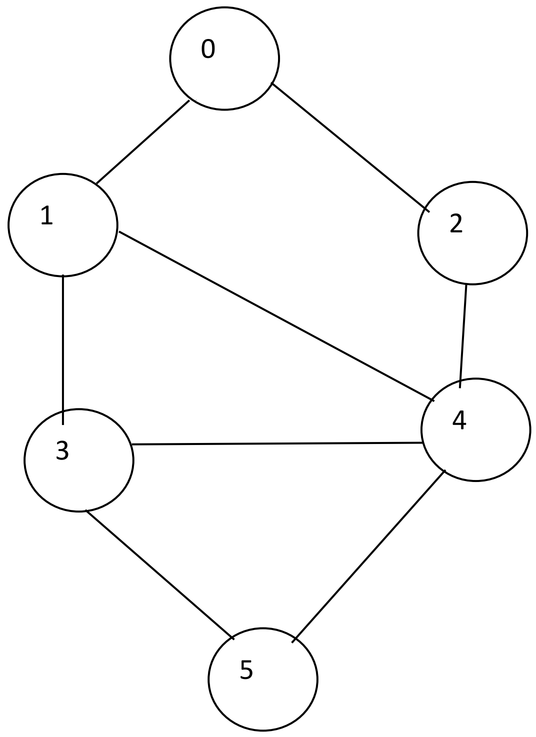
Assignment 1

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 vetex: "<<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 vetex:
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
```