Experiment No. – 2.2

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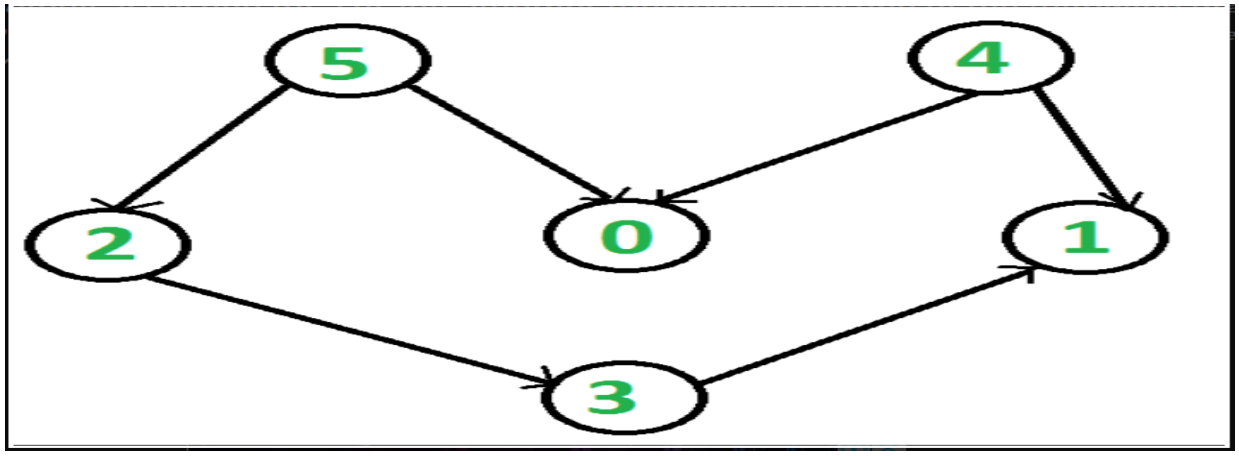
Branch: 20BCC1 **Section/Group: A**
Semester: 5th **Date of Performance: 24/09/2022**
Subject Name: ADVANCED PROGRAMMING LAB
Subject Code: 20CSP-334

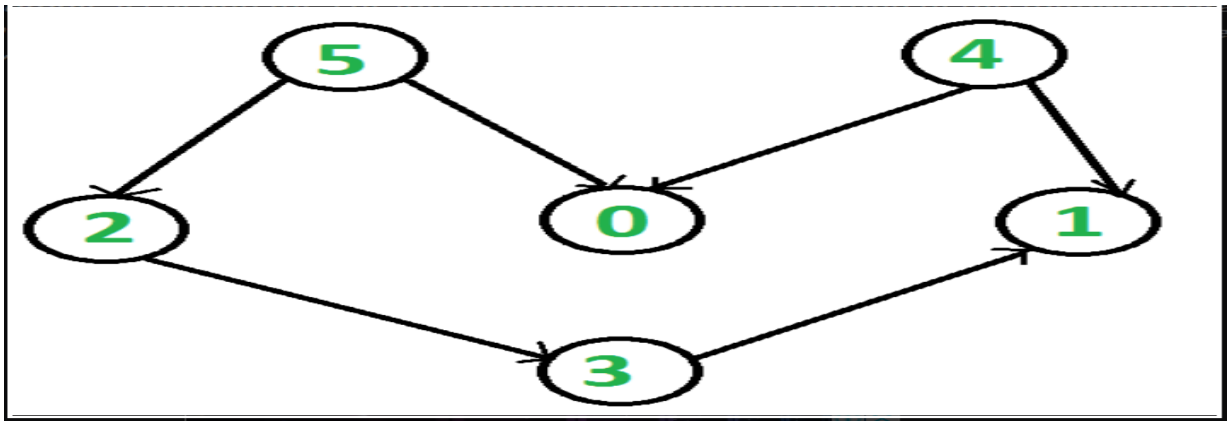
1. Aim/Overview of the practical:

Obtain the Topological ordering of vertices in a given digraph.



2. Task to be done:

Obtain the Topological ordering of vertices in a given digraph



3. Steps for practical:

Approach:

- Create a stack to store the nodes.
- Initialize visited array of size N to keep the record of visited nodes.
- Run a loop from 0 till N
- if the node is not marked True in visited array
- Call the recursive function for topological sort and perform the following steps.
- Mark the current node as True in the visited array.
- Run a loop on all the nodes which has a directed edge to the current node
- if the node is not marked True in the visited array:
- Recursively call the topological sort function on the node
- Push the current node in the stack.
- Print all the elements in the stack.

4 . Code:

```
// A C++ program to print topological
// sorting of a DAG
#include <bits/stdc++.h>
using namespace std;

// Class to represent a graph
class Graph {
    // No. of vertices'
    int V;

    // Pointer to an array containing adjacency listsList
    list<int>* adj;
```

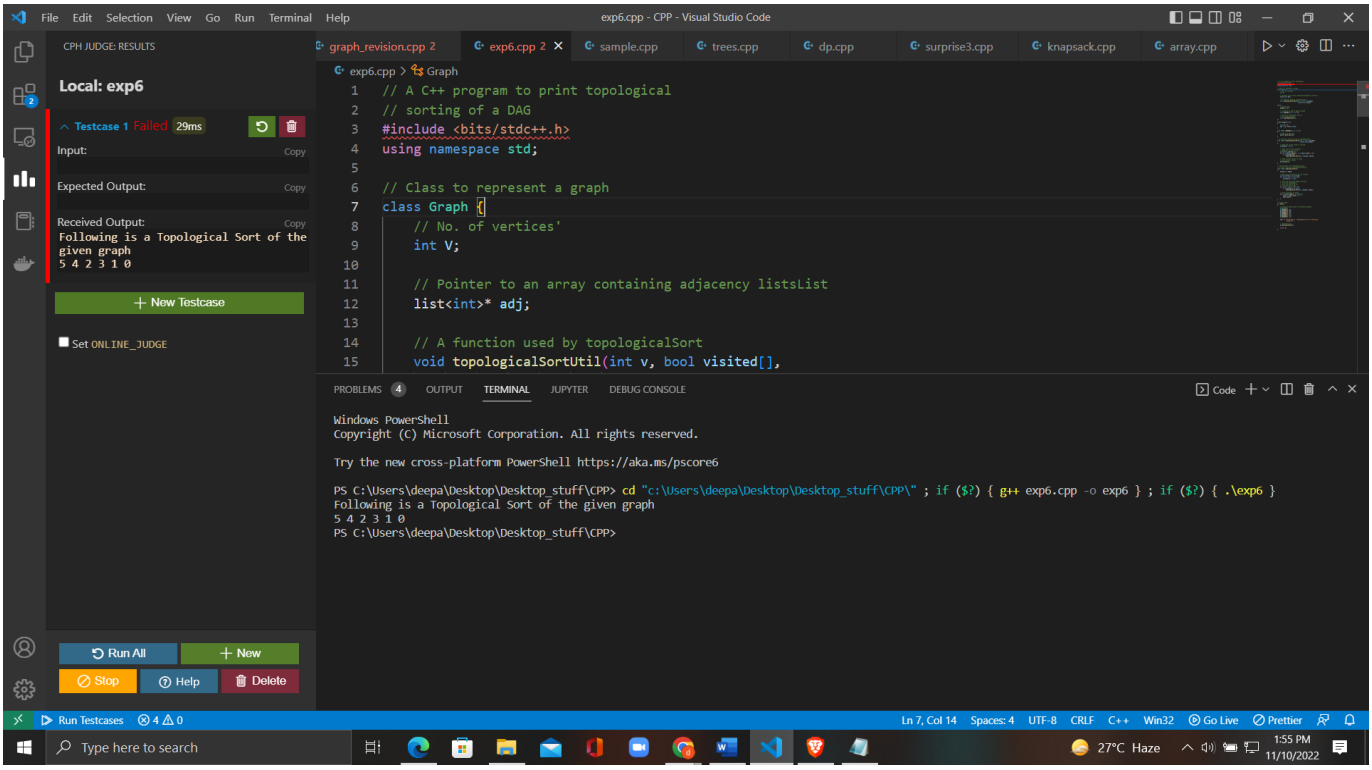
```
    // A function used by topologicalSort
    void topologicalSortUtil(int v, bool visited[],
                             stack<int>& Stack);

public:
    // Constructor
    Graph(int V);

    // function to add an edge to graph
    void addEdge(int v, int w);

    // prints a Topological Sort of
    // the complete graph
    void topologicalSort();
};

Graph::Graph(int V)
{
    this->V = V;
    adj = new list<int>[V];
}

void Graph::addEdge(int v, int w)
{
    // Add w to v's list.
    adj[v].push_back(w);
}

// A recursive function used by topologicalSort
void Graph::topologicalSortUtil(int v, bool visited[],
                                stack<int>& Stack)
```

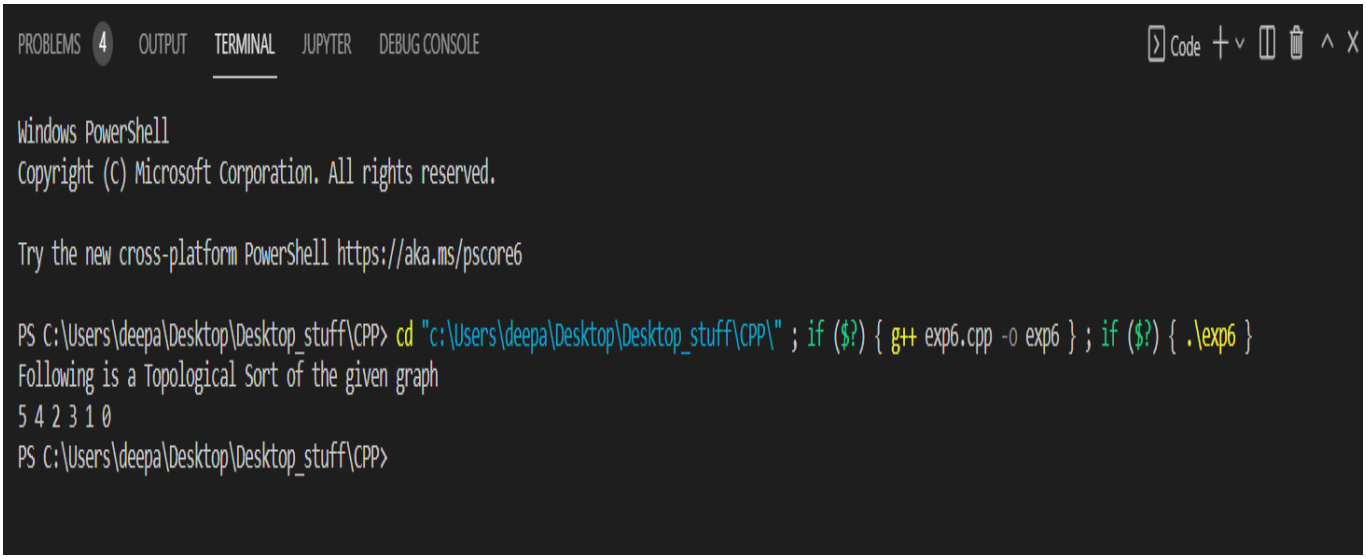
```
{
    // Mark the current node as visited.
    visited[v] = true;

    // Recur for all the vertices
    // adjacent to this vertex
    list<int>::iterator i;
    for (i = adj[v].begin(); i != adj[v].end(); ++i)
        if (!visited[*i])
            topologicalSortUtil(*i, visited, Stack);

    // Push current vertex to stack
    // which stores result
    Stack.push(v);
}

// The function to do Topological Sort.
// It uses recursive topologicalSortUtil()
void Graph::topologicalSort()
{
    stack<int> Stack;

    // Mark all the vertices as not visited
    bool* visited = new bool[V];
    for (int i = 0; i < V; i++)
        visited[i] = false;

    // Call the recursive helper function
    // to store Topological
    // Sort starting from all
    // vertices one by one
    for (int i = 0; i < V; i++)
```

```
        if (visited[i] == false)
            topologicalSortUtil(i, visited, Stack);

    // Print contents of stack
    while (Stack.empty() == false) {
        cout << Stack.top() << " ";
        Stack.pop();
    }
}

// Driver Code
int main()
{
    // Create a graph given in the above diagram
    Graph g(6);
    g.addEdge(5, 2);
    g.addEdge(5, 0);
    g.addEdge(4, 0);
    g.addEdge(4, 1);
    g.addEdge(2, 3);
    g.addEdge(3, 1);

    cout << "Following is a Topological Sort of the given "
            "graph \n";

    // Function Call
    g.topologicalSort();

    return 0;
}
```

5. Output:

a)


exp6.cpp - CPP - Visual Studio Code
CPH JUDGE: RESULTS
Local: exp6
Testcase 1 Failed 29ms
Input:
Expected Output:
Received Output:
Following is a Topological Sort of the given graph
5 4 2 3 1 0
New Testcase
Set ONLINE_JUDGE
Run All
New
Stop
Help
Delete
// A C++ program to print topological
// sorting of a DAG
#include <bits/stdc++.h>
using namespace std;
// Class to represent a graph
class Graph {
// No. of vertices'
int V;
// Pointer to an array containing adjacency listsList
list<int>* adj;
// A function used by topologicalSort
void topologicalSortUtil(int v, bool visited[],
PROBLEMS 4 OUTPUT TERMINAL JUPYTER DEBUG CONSOLE
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.
Try the new cross-platform PowerShell https://aka.ms/pscore6
PS C:\Users\deepa\Desktop\Desktop_stuff\CPP> cd "c:\Users\deepa\Desktop\Desktop_stuff\CPP\" ; if ($?) { g++ exp6.cpp -o exp6 } ; if ($?) { .\exp6 }
Following is a Topological Sort of the given graph
5 4 2 3 1 0
PS C:\Users\deepa\Desktop\Desktop_stuff\CPP>


PROBLEMS 4 OUTPUT TERMINAL JUPYTER DEBUG CONSOLE
Code
Windows PowerShell
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Try the new cross-platform PowerShell https://aka.ms/pscore6
PS C:\Users\deepa\Desktop\Desktop_stuff\CPP> cd "c:\Users\deepa\Desktop\Desktop_stuff\CPP\" ; if ($?) { g++ exp6.cpp -o exp6 } ; if ($?) { .\exp6 }
Following is a Topological Sort of the given graph
5 4 2 3 1 0
PS C:\Users\deepa\Desktop\Desktop_stuff\CPP>

6. Learning Outcomes:

- To learn the basics of Graph to how to take inputs.
- To learn the approach to how to solve problems related to graph.
- To learn about how to use stack data structure.

Evaluation Grid (To be created as per the SOP and Assessment guidelines by the faculty):

Sr. No.	Parameters	Marks Obtained	Maximum Marks
1.			
2.			
3.			