

Task-1: Finding strong connected graph

```
dfs.cpp - Code::Blocks 20.03
File Edit View Search Project Build Debug Fortran wxSmith Tools Tools+ Plugins DoxyBlocks Settings Help
<global>
Start here X *Untitled1 X topology.cpp X dfs.cpp X
1 #include<bits/stdc++.h>
2 using namespace std;
3
4 int n;
5 vector<string> clr;
6 vector<int> par, d, f;
7 int global_time;
8 vector<int> cycle_nodes;
9
10 void DFS(vector<vector<int>>& g, int u) {
11     clr[u] = "g";
12     global_time++;
13     d[u] = global_time;
14     for (int v : g[u]) {
15         if (clr[v] == "w") {
16             par[v] = u;
17             DFS(g, v);
18         } else if (clr[v] == "g") {
19             int node = u;
20             cycle_nodes.clear();
21             while (node != v) {
22                 cycle_nodes.push_back(node);
23                 node = par[node];
24             }
25             cycle_nodes.push_back(v);
26             reverse(cycle_nodes.begin(), cycle_nodes.end());
27             for (int c : cycle_nodes) {
28                 cout << c << " ";
29             }
30             cout << endl;
31 }
```

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```
dfs.cpp - Code::Blocks 20.03
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<global>
main() : int
Start here X *Untitled1 X topology.cpp X dfs.cpp X
34 global_time++;
35 f[u] = global_time;
36 }
37
38 int main() {
39     int e, u, v;
40     cin >> n >> e;
41     vector<vector<int>> g(n + 1);
42
43     for (int i = 0; i <= n; i++) {
44         clr.push_back("w");
45         d.push_back(0);
46         f.push_back(0);
47         par.push_back(-1);
48     }
49
50     for (int i = 0; i < e; i++) {
51         cin >> u >> v;
52         g[u].push_back(v);
53     }
54
55     global_time = 0;
56
57     for (int i = 0; i < n; i++) {
58         if (clr[i] == "w") {
59             DFS(g, i);
60         }
61     }
62
63     return 0;
64 }
```

```
"G:\3rd year 1st semester" X
9
0 1
1 2
2 3
3 0
2 4
4 5
5 6
6 4
6 7
0 1 2 3
4 5 6

Process returned 0 (0x0)   execution time : 4.84
5 s
Press any key to continue.
```

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Task-2: Topological sorting

```
topology.cpp - Code::Blocks 20.03
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<global> main(): int
Start here x *Untitled1 x topology.cpp x dfs.cpp x
1 #include <bits/stdc++.h>
2 using namespace std;
3
4 int n, m;
5 vector<int> in_degree, order;
6 vector<vector<int>> graph;
7
8 void topologicalSort() {
9     queue<int> q;
10    for (int i = 0; i < n; i++) {
11        if (in_degree[i] == 0) q.push(i);
12    }
13
14    while (!q.empty()) {
15        int u = q.front();
16        q.pop();
17        order.push_back(u);
18
19        for (int v : graph[u]) {
20            in_degree[v]--;
21            if (in_degree[v] == 0) q.push(v);
22        }
23    }
24 }
25
26 int main() {
27     cin >> n >> m;
28     graph.resize(n);
29     in_degree.resize(n, 0);
30
31     for (int i = 0; i < m; i++) {
```

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```
topology.cpp - Code::Blocks 20.03
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<global>
Start here x *Untitled1 x topology.cpp x dfs.cpp x
20     in_degree[v]--;
21     if (in_degree[v] == 0) q.push(v);
22 }
23 }
24 }
25
26 int main() {
27     cin >> n >> m;
28     graph.resize(n);
29     in_degree.resize(n, 0);
30
31     for (int i = 0; i < m; i++) {
32         int u, v;
33         cin >> u >> v;
34         graph[u].push_back(v);
35         in_degree[v]++;
36     }
37
38     topologicalSort();
39
40     if (order.size() == n) {
41         for (int task : order) {
42             cout << task << " ";
43         }
44     } else {
45         cout << "Cycle detected, no valid order exists.";
46     }
47
48     return 0;
49 }
```

```
"G:\3rd year 1st semestre x + - _ x
7
9
0 1
0 2
1 5
1 2
2 3
5 4
5 3
6 1
6 5
0 6 1 5 2 4 3
Process returned 0 (0x0) execution time : 3.78
5 s
Press any key to continue.
```

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