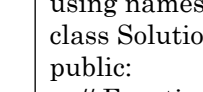
Cycle detection in undirected graph using Breadth First Search in C++

```
#include <bits/stdc++.h>
using namespace std;
class Solution {
public:
    // Function to detect cycle in a directed graph.
    bool isCyclic(int V, vector<int> adj[]) {
        int indegree[V] = {0};
        for (int i = 0; i < V; i++) {
            for (auto it : adj[i]) {
                indegree[it]++;
            }
        }
        queue<int> q;
        for (int i = 0; i < V; i++) {
            if (indegree[i] == 0) {
                q.push(i);
            }
        }
        int cnt = 0;
        // o(v + e)
        while (!q.empty()) {
            int node = q.front();
            q.pop();
            cnt++;
            // node is in your topo sort
            // so please remove it from the indegree
            for (auto it : adj[node]) {
                indegree[it]--;
                if (indegree[it] == 0) q.push(it);
            }
        }

        if (cnt == V) return false;
        return true;
    }
};
int main() {
    //V = 6;
    vector<int> adj[6] = {{}, {2}, {3}, {4, 5}, {2}, {}};
    int V = 6;
    Solution obj;
    bool ans = obj.isCyclic(V, adj);
    if (ans) cout << "True";
    else cout << "Flase";
    cout << endl;
    return 0;
}
```

Graph looks like:-



Adjacency list looks like:-

adj[0] = {}
adj[1] = {2}
adj[2] = {3}
adj[3] = {4, 5}
adj[4] = {2}
adj[5] = {}

Step 1: Calculate Indegree

- Initialize indegree[] = {0, 0, 0, 0, 0, 0}.
- Traverse adjacency list to calculate indegree:
    - 1 → 2: indegree[2]++ → indegree[] = {0, 0, 1, 0, 0, 0}
    - 2 → 3: indegree[3]++ → indegree[] = {0, 0, 1, 1, 0, 0}
    - 3 → 4: indegree[4]++ → indegree[] = {0, 0, 1, 1, 1, 0}
    - 3 → 5: indegree[5]++ → indegree[] = {0, 0, 1, 1, 1, 1}
    - 4 → 2: indegree[2]++ → indegree[] = {0, 0, 2, 1, 1, 1}
- Final indegree[]: {0, 0, 2, 1, 1, 1}.

Step 2: Add Nodes with indegree == 0 to Queue

- Nodes with indegree == 0: 0, 1.
- Initialize queue = {0, 1}.

Step 3: Process Queue (Topological Sort)

1. **Process Node 0**:
    - Dequeue 0, cnt++ → cnt = 1.
    - Node 0 has no outgoing edges; no changes to indegree[].
    - queue = {1}.
2. **Process Node 1**:
    - Dequeue 1, cnt++ → cnt = 2.
    - Node 1 → Node 2: Decrease indegree[2]-- → indegree[] = {0, 0, 1, 1, 1, 1}.
    - Node 2 has indegree != 0, so it is not added to the queue.
    - queue = {}.

Step 4: Check for Remaining Nodes

- **Cycle Exists**:
    - Processed nodes (cnt = 2) < Total nodes (V = 6).
    - A cycle exists, as some nodes (like 2, 3, 4, 5) were never processed.

Output:-

True
The graph contains a cycle