

Sample Input \Rightarrow numCourses = 4
prerequisites = $[[1, 0], [2, 1], [3, 2]]$

Initialization

adjList = $[[], [], [], []]$

indegree = $[0, 0, 0, 0]$

topOrder = $[]$ \rightarrow store the final order of courses

queue = dequeue \rightarrow Processing courses with 0 in-degree

STEP 1: Build an adjacency list & compute indegree

1. Prerequisite = $[1, 0]$ in prerequisite list
Course $\rightarrow 1$ prereq $\rightarrow 0$, update adjList & indegree array

adjList = $[[1], [], [], []]$ # $0 \rightarrow 1$

indegrees = $[0, 1, 0, 0]$

- ② Prerequisite = $[2, 1]$ in prereq given list

Course = 2 prereq = 1, update adjList & indegree array

adjList = $[[1], [2], [], []]$ # $1 \rightarrow 2$

indegrees = $[0, 1, 1, 0]$

- ③ Prerequisite = $[3, 2]$ in given prereq list

Course = 3 prereq = 2, update adjList & indegree array

adjList = $[[1], [2], [3], []]$ # $2 \rightarrow 3$

indegree = $[0, 1, 1, 1]$

STEP 2: Initialize queue with 0 indegree course

indeg. $0 \rightarrow 1 \rightarrow 2 \rightarrow 3$

Queue = $[0]$ Add '0' to topOrder

topOrder = $[0]$

STEP 3: Process Nodes in BFS manner

- ① Dequeue '0' from queue

process neighbor of '0' topOrder = $[0]$

so decrement indegree of 1 indegree = $[0, 0, 1, 1]$

- Indegree of 1 is 0 now queue = $[1]$

so add it to queue

2. Dequeue 1 from queue
 [1, 0, 1, 2, 3] \rightarrow toporder = [0, 1]
 indegrees = [0, 0, 0, 1]
 • process neighbor of '1'
 • Update indegree (decrement)
 • If indegree '0' add to queue

3. Dequeue 2 from queue
 [1, 0, 1, 2, 3] \rightarrow toporder = [0, 1, 2]
 indegrees = [0, 0, 0, 1]
 • process '3' (neighbor) of '2'
 • Update indegree (decrement)
 • If indegree '0' add to queue
 queue = [3]
 toporder = [0, 1, 2, 3]
 indegree = [0, 0, 0, 0]
 queue = [3]

4. Dequeue 3 from queue
 [1, 0, 1, 2, 3] \rightarrow toporder = [0, 1, 2, 3]
 indegrees = [0, 0, 0, 0]
 • add 3 to toporder
 • Update indegree of queue
 queue = [3]
 toporder = [0, 1, 2, 3]
 indegree = [0, 0, 0, 0]

Conclusion: length of toporder = 4, which is equal to numCourses. (No cycles in graph)

Return True

All courses can be finished

Time $\rightarrow O(V+E)$

Space $\rightarrow O(V+E)$