CSC 310: Algorithms and Data Structures

Lab7

Problem 1 – 3-Coloring

Given an undirected graph G, write a most-efficient program to determine whether G is 3-colorable. The program should implement the last method described in class: branch on a maximum-degree vertex by either coloring it with color 1 or color 4 where all vertices of color 4 are supposed to induce a bipartite subgraph.

Input. Your program will be tested against multiple test cases. Each test case consists of two integers n and e, representing the number of vertices and edges respectively. The next e lines consist of the list of edges, each given with a pair of its endpoints.

Output. For each test case, print Yes if G is 3 colorable otherwise print No.

Sample input	Sample output
5 6 0 1 0 2 1 2 1 3 2 3 3 4	Yes
7 11 0 1 0 2 1 2 1 3 2 3 3 4 3 5 4 5 5 6 3 6 4 6	No

Problem 2 – Vertex Cover

Given an undirected graph G and a positive integer k, you are asked to write a most-efficient code to check whether G has a vertex cover of cardinality at most k.

Input. Your program will be tested against multiple test cases. Each test case consists of three integers *n*, *e*, and *k* representing the number of vertices, number of edges, and possible vertex cover size *k*, respectively. Again, the next *e* lines consist of the list of edges, each given with a pair of its endpoints.

Output. You should print "Yes" if the graph has vertex cover of size $\leq$ *k*, "No" otherwise.

Sample Input	Sample Output
5 5 3 0 1 0 2 1 3 2 4 3 4	Yes
5 6 2 0 1 0 2 1 2 1 3 2 3 3 4	No

Remark:
You are expected to submit the codes on Sharif judge by midnight of Saturday.