Indian Institute of technology, Guwahati
Department of Computer Science and Engineering
Data Structure Lab: (CS210)
Lab Test-3

Date: 23rd October 2017 **Total Marks: 20**

1. Let G = (V, E) be a **directed** graph. Write the Depth-first search (DFS) algorithm of graph G using stack to eliminate recursion. Nodes should be considered in alphabetical order. Your algorithm should print the depth first tree edges in the order they are explored by your algorithm. **[10]**

2. Modify and write an enhanced version of your DFS algorithm to print out every edge in the directed graph together with its type. **[10]**

Write two functions for the above two problems in a single file. Your main should contain only function calls like read graph, dfs, dfs_enhanced, etc. Use adjacency list to represent the graph.

Input format: First line will contain two numbers **n**, number of nodes and **e**, number of edges.
Next e lines will contain edges of the form **u v** where u is source node and v is destination node.

Output format: For part 1, tree edges of the form (u, v).
For part 2, tree, forward, back and cross edges each of the form (u, v).

Test Case:
Input:
10 14
q s
s v
v w
w s
q w
q t
t x
x z
z x
t y
y q
r y
r u
u y

Output:
For part 1:
(q, s), (s, v), (v, w), (q, t), (t, x), (x, z), (t, y), (r, u)

For part 2:
Tree edges: (q, s), (s, v), (v, w), (q, t), (t, x), (x, z), (t, y), (r, u)
Back edges: (w, s), (z, x), (y, q)
Forward edges: (q, w)
Cross edges: (r, y), (u, y)