

**Instructions.** This is a mini homework on depth first search. Write your name, Roll No., the problem number, the date and the names, if any, of students with whom you collaborated.

**Problem 1.** Show how DFS works on the graph in Figure 1. Assume that at each vertex, your DFS procedure considers the neighbors in alphabetic order. Label each vertex with its discovery and finishing time respectively.

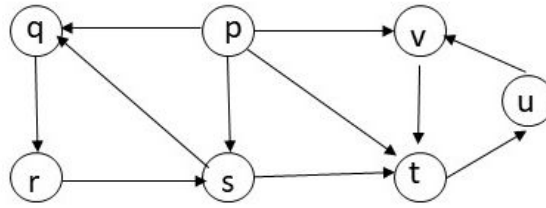


Figure 1: A directed graph for question 1

**Problem 2.**

1. Modify the text-book DFS so that you can test whether the input (undirected) graph has a cycle or not. If yes, can you print one cycle?
2. Modify DFS so that as you encounter each edge, classify and print it as one of tree, back, forward or cross edge respectively. Argue correctness.

**Problem 3.**

1. Give an example of an undirected graph  $G$  having two distinct vertices  $u$  and  $v$  such that (i) there is a path from  $u$  to  $v$ , (ii) there is a path from  $u$  to  $v$ , and, (iii) in a DFS of  $G$ ,  $u.d < v.d$  but  $v$  is not a descendant of  $u$  in the DFS tree. (A graph on 3 vertices suffices).
2. Solve the same problem for directed graphs.