Homework 2 Instructions

The goal of this homework is to implement the breadth-first search and depth-first search algorithms in the *Algorithm Design* book presented on pages 90-91 and 93. The pseudo code is as follows:

and page 79

Breadth-First Search

```
BFS(s):
  Set Discovered[s] = true and Discovered[v] = false for all other v
  Initialize L[0] to consist of the single element s
  Set the layer counter i = 0
  Set the current BFS tree T = ∅
  While L[i] is not empty
    Initialize an empty list L[i+1]
    For each node u ∈ L[i]
      Consider each edge (u,v) incident to u
      If Discovered[v] = false then
        Set Discovered[v] = true
        Add edge (u,v) to the tree T


        Add v to the list L[i+1]
      Endif
    Endfor
    Increment the layer counter i by one
  Endwhile
```

Depth-First Search

```
DFS(s):
  Initialize S to be a stack with one element s
  While S is not empty
    Take a node u from S
    If Explored[u] = false then
       Set Explored[u] = true
       For each edge (u,v) incident to u
         Add v to the stack S
       Endfor
    Endif
  Endwhile
```

Important without recursion:
先进后出stack;所以加进去的顺序很重要,
有时候结果可能是反的

u v
0:[1,2,3,4]
1:[3,6,8,9]
2:[4,5,6,7]

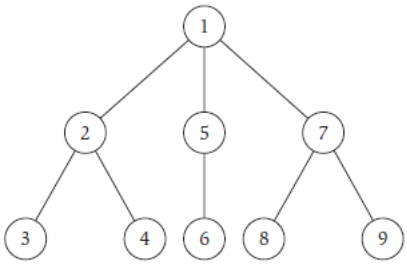
1. Create two python files named “bfs_ lastname” and “dfs_ lastname”, with ***lastname*** corresponding to your last name. For example, if my last name is Moore, I would create two python files named
   “bfs_ moore” and “dfs_ moore”

2. Your program should be able to run from the console using the command

python bfs _ID.py input.txt
python dfs_ID.py input.txt

where the arguments are your program and the input file. ***Your program should write to stdout, not an output file.*** I will be using Python 3.6 to grade your assignments.

3. Your program should read in an input text file that contains the head of the graph and a list of vertices for the edges on the graph. For example, for the graph below, the input file should have the following format:

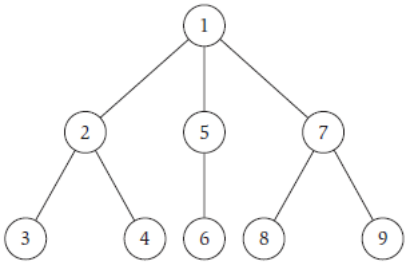


1

1,2
1,5
1,7
2,3
2,4
5,6
7,8
7,9

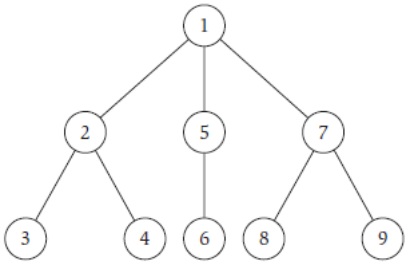
The head of the graph above is 1. The input *1,7* means that node 1 is connected to node 7, and node 7 is connected to node 1.

4. The program **bfs** should take in the head of the list and the edges between nodes and performs a breadth-first search on the graph. The search should operate in a left-to-right manner. This means that if a node has multiple children, then it should with the leftmost child. The program should output the order of the explored nodes according to the bread-first search algorithm. For example, for the graph below, the **bfs** program would output the following:



1 2 5 7 3 4 6 8 9

5. The program **dfs** should read in the head of the list and the edges between nodes and performs a depth-first search on the graph. The search should operate in a left-to-right manner. This means that if a node has multiple children, then it should with the leftmost child. The program should output the order of the explored nodes according to the depth-first search algorithm. For example, for the graph above, the **dfs** program would output the following:



1 2 3 4 5 6 7 8 9

6. You can further test your program by creating input text files following the format of the sample input text files provided.

7. Please submit your assignment in the appropriate location on Blackboard. If you get stuck or have any questions, please feel free to email me at romoore@ku.edu. I will try to get back to you as quickly as possible. It is better to contact me during the week, as I am less responsive on the weekend because, well, it is the weekend. This does not mean that I will not respond to your emails on the weekend, it only means that the response time will be longer than it would be during the week. However, I will do the best I can to respond as quickly as possible.