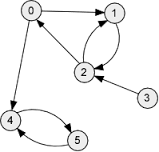
**Algorithms (CSCI 323 & 700)**

**Spring 2016 - Homework #6**

**(Due at the beginning of class on 4/6/2016)\***

*The first four questions relate to material from prior lectures for which there has not yet been homework. The last questions pertains to the most recent material on graphs.*

1. Suppose we want to store messages made up of 4 characters a, b, c, d with frequencies 60, 5, 30, 5 respectively. (a) How much total space is required to represent the data if we use a fixed-length code, assuming that each characters requires 2 bits, the minimum needed for an alphabet of four characters? (b) How much total space is required if we instead use a Huffman-style prefix-free code to represent the data?
2. Consider a hash function which takes the first character in the key and maps it to a number 0 to 25 (i.e. a is 0, b is 1, c is 2, …, z is 25). Consider the list of ten strings: banana, apricot, cranberry, fig, lime, melon, lemon, apple, cherry, date. (a) Show the resultant hash-table, assuming collision-resolution by chaining. (b) Show the resultant hash table, assuming collision-resolution by probing with an increment of one.
3. (a) Draw the binary search tree that is created using the letters E, A, S, Y, Q, U, E, S, T, I, O, N. (Remember: there should be no duplicates in the BST.) (b) Is Q-U-I-T a valid search path? Why or why not?
4. What are some of the pros and cons of the “trie” data structure compared to an ordinary binary search tree?
5. Answer the questions about the graph G below.



Is G directed or undirected?

Using set notation, list the vertices (V) in G.

Using set notation, list the edges (E) in G.

Does G contain a loop? If yes, identify one.

Does G contain a cycle? If yes, identify one.

State the in-degree of vertex 2

State the out-degree of vertex 2

Provide the Adjacency Matrix for G.

Provide the Adjacency Table for G.

\* Only if you will not be able to attend class on the due date, submit your solutions - *before 6:00 p.m. on the due date* - to the instructor at LT.CS320@yahoo.com