DEPARTMENT OF COMPUTER SCIENCE AND SOFTWARE ENGINEERING
CONCORDIA UNIVERSITY
COMP 5511: Principles of Data Structures

Fall 2017

ASSIGNMENT 2

Due: see CrsMgr

Theoretical Part

1. (8 points) Consider the binary search tree in Figure 2.
    a. What tree results after you insert the nodes 80, 65, 75, 45, 35, and 25, in that order? Give the sequence of the tree after each insertion.
    b. After inserting the nodes in part a, what tree results when you delete the nodes 50 and 20? Give the sequence of the tree after each deletion.

2. (4 points) Draw a (single) binary tree T, such that
   Each internal node of T stores a single character
   - A *preorder* traversal of T yields ALGORITHMS
   - An *inorder* traversal of T yields GOLATIHRMS

3. (8 points) For each of the following situations, which of these ADTs (1 through 5) would be most appropriate: (1) a queue; (2) a stack; (3) a vector; (4) a priority queue (5) none of these?

   Example: To model the situation of the customers at a deli counter who take numbers to mark their turn - a queue is most appropriate!

   - An alphabetic list of names
   - A grocery inventory ordered by the occurrence of the items in the store
   - The items on a cash register tape (with a dual tape: one is torn and given to the customer, the other is kept by the merchant: the one we are concerned with is the merchant's tape)
   - A word processor that allows you to correct typing errors by using the backspace key
   - A collection of ideas in chronological order
   - Air planes that stack above a busy airport, waiting to land
   - People who are put on hold when they call a customer service number.
   - An employer who fires the most recently hired person

Programming Part

4. (10 points) Write a java program to count the number of elements in a singly linked list.

      a. Iteratively   b. Recursively

5. (10 points) Imagine a singly linked list of integers that are sorted into ascending order. The head pointer points to the first node, which contains the smallest integer. See Figure 1 (a). Using List ADT, write a java program that revises the list so that its data are sorted into descending order. The head pointer points to the first node, which contains the largest integer. See Figure 1 (b).
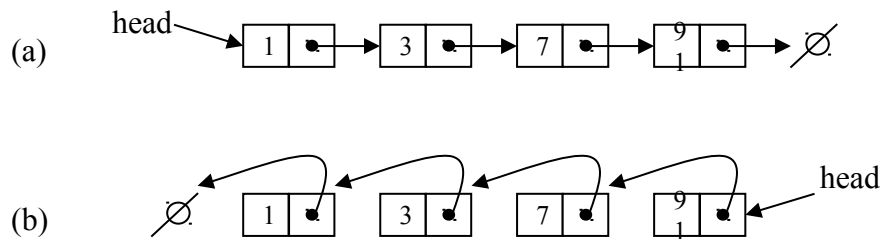

Figure 1

6. (20 points) Write a programs to compare sorting time using (a) selection sort and (b) quick sort to sort a list of records containing names. The file ds17s-asg2-data.txt contains some data to use for the sorting. Measure the time needed to perform the sort in both cases.
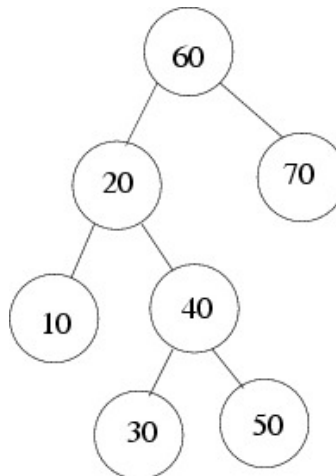
Figure 2