LO27 - 2015 A - FSOJ - OJ

F2015 Final Exam LO21 and LO27 Wednesday, January 13th, 2016

Terms:

- Duration: 2 hours
- Documents, calculator and phone are not authorized
- The rate is indicative (±1)
- **One sheet per exercise**

Exercise 1 (15 points) – Lists

Considering a financial market led by orders: market players directly exchange without passing through an intermediary. In simplified terms, the trade is made by considering an order to buy and a list of orders to sell. An order is characterized by the reference title to buy or sell (an integer, the stock reference), the quantity to buy or sell (an integer), the maximum purchase price or minimum sale price (a real) and the emitter (character string, the name of the seller or the buyer).
The list of orders to sell is sorted in ascending order first on the title of references, then on ascending prices.

1) Given a purchase order (a reference title, the desired quantity, a maximum purchase price, the name of the buyer) and a list of orders to sell, write the **recursive** algorithm of the subroutine ***isSatisfiable*** to determine if this purchase order can be satisfied or not.
A purchase order can be satisfied if there are in the whole list of orders to sell a quantity available of the searched title that greater or equals to the desired quantity and at a price lower or equal to the maximum purchase price.
In other words, a single purchase order can be satisfied by combining all or part of several orders to sell. (4 points)

2) Give in C the complete declaration of the type lists of orders represented as a singly linked list. (2 points)

3) Write in C the **iterative** version of the subroutine ***isSatisfiable*** (see question 1). (4 points)

4) Given a purchase order and a list of orders to sell, write the **iterative** algorithm of the subroutine ***satisfiableWith*** that returns the list of sell orders (title reference, quantity, price, vendor name) used to meet the proposed purchase order. The resulting list is empty if the purchase order cannot be satisfied. (5 points)

Example:
Order to buy: (reference: 1, quantity: 16, price: 14.5, emitter: Gaud)
List of orders to sell: (reference: 1, quantity: 2, price: 7.5, Martinet), (1, 8, 8.5, Lamotte), (1, 8, 8.5, Koukam), (1, 4, 15.0, Hajjam), (2, 3, 5.0, Koukam), (2, 3, 17.5, Gaud)
Resulting list: (1, 2, 7.5, Martinet), (1, 8, 8.5, Lamotte), (1, 6, 8.5, Koukam)

Exercise 2 (5 points) – Binary Trees

Given an integer binary tree, and two integers x and y, write the algorithm of the **recursive** subroutine ***areSiblings*** to test if x and y are siblings (brothers) in the tree. x and y are siblings if it exists a node in the tree where the root value of its left child is equal to the value of x and the root value of its right child is equal to y, or vice versa.