Ex #2: Dynamic data structures

Requirements:

Knowledge of the structure of the ordered list and Binary Search Tree (BST) with particular emphasis on:

- creating and deleting the ordered list and tree,

- searching for an item in an ordered list and tree,

- removing an item from the ordered list and tree,

- tree searching in 3 orders: pre-order, in-order and post-order

the definition of a AVL -balanced tree and balanced BST

Instructions for the exercise:

1. Write a program to create a students' list. The program should enable storing data on the dynamic ordered list (one directional searching) and in BST. It should also allow adding an element to the existing structure, searching for the element and deleting it from the structure. Each element consists of a surname, first name and index number. (12 characters First Name, 12 characters Last Name, 7 digits Index No.)

2. Prepare data sets for testing the time needed for performing individual operations(add, search, delete element) on the tested data structures. Such a set should contain n records (surname, first name, index number), but only the index number will be treated as a key for operations performed on data structures (Data to the input table read from a previously generated text file – the file should be editable - not a binary file).

3. Measure the time needed to add elements to the considered structures, data sets of different sizes *n*, and to remove all elements (removing elements one by one – these elements for removing are chosen randomly).

In addition, examine the time necessary to search elements in each of the structures (function of *n*) - by measuring the average search time of all elements in turn, if necessary run several turns).

In this case, you should compare the times of three following structures: the ordered list, BST and Balanced BST (BBST). The element again should be selected randomly.

The results of the experiments should be presented in tables and charts:

a) dependence of insertion time of the number *n* – average time for given structures,

b) searching for the selected element – average time for given structures.

4. write the conclusions and remarks from the experiments.