Homework 5: Binary Search Trees

COS 226 – Spring 2024

Assigned: 17 March 2024 Due: 01 April 2024

Do each of the parts below. Turn in a ZIP file containing:

- The Python code file(s) from homework 5.
- A file BST.py that contains your binary search tree implementation (see below).
- A file AVL.py that contains your AVL tree implementation (see below)
- A file `tests.txt` or `tests.pdf` that show tests of your code.
- Any input files you used to test your code

If you were unable to get your code working for homework 5, let me know *soon* so I can give you something to work with!

Note that you only have *two weeks* to get this done.

1. Using your tree implementations for homework 4, create a new class, `BST`, that implements a simple, non-balancing binary search tree.

   I should be able to take your `BST.py` file and load it by this line from the directory in which I unzip your files:

   ```
   from BST import *
   ```

   I should then be able to create it using something like:

   ```
   b = BST([1,10,20,50,2,3])
   ```

   I should be able to search it via:

   ```
   p = b.search(20)
   ```

   and have it return a position representing where that element is. I should be able to get list of the elements in order by:

   ```
   b.list()
   ```

   and insert with:

   ```
   p = b.insert(-35)  # where p is a position
   ```

and delete with:

```
b.delete(20)
```

Your position class needs to support at least these methods, if `p` is a position:

```
p.value()    # returns value of corresponding node
p.next()     # returns successor of node
p.prev()     # returns predecessor of node
```

Your tree should provide a method:

```
b.display()
```

That will display the tree in a manner that shows its structure.

2. Using your implementation of the `BST` class from (1), implement a new class, `AVL`, that implements AVL trees. The same methods as above for `BST` should exist for `AVL`.

We will likely run your code with a program using the above methods. However, you *must* also show me your code running (in text file `tests.txt` or PDF file `tests.pdf` mentioned above).