CSE221 Programming Assignment 3

Due: 11/08/2022 at 4:00pm

Instruction: zip your source code as assignment3_yourStudentID.zip and submit it via Blackboard. Please make sure your code is runnable, otherwise you will get no point since we cannot debug your code for grading. We will use C++ 11 and your code should be compiled in Linux. Please do not use any STL libraries. Also please provide examples of how to use your code in *main()*.

1. (30 points) Generalize the Heap data structure from a binary tree to a *k*-ary tree, for an arbitrary $k \geq 2$. Study the relative efficiencies (in terms of actual running time) of the resulting data structure for various values of k, by inserting and removing a large number of randomly generated keys into each data structure, which should be included in your *main()* function. Your *main()* should also include code for visualizing your heap data structures before and after the operations.

2. (35 points) Implement the map ADT with a hash table with separate-chaining collision handling. Your *main()* should include code for *put*, *erase* and other operation examples and visualizing your hash table data structures before and after the operations.

3. (35 points) Write a C++ class that implements all the functions of the ordered map ADT using an AVL tree. Your *main()* should also include code for visualizing your data structures before and after the operations.