CSE221 Programming Assignment 4

Due: 12/01/2022 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) Implement merge-sort and quick-sort and perform a series of benchmarking tests (in your *main()*) to see which one is faster. Your tests should include sequences that are "random" as well as "almost" sorted.

2. (30 points) Implement the LCS algorithm and use it to compute the best sequence alignment between some DNA strings (each has 10 characters) that you choose from the attached *DNA_seq_sample.txt*. Your code should print both the length of LCS and the subsequence itself in your *main()*.

3. (40 points) Perform an experimental comparison of the relative speeds of the brute-force, KMP, and BM pattern matching algorithms. Document the time taken for coding up each of these algorithms as well as their relative running times on documents found on the Internet that are then searched using varying-length patterns.

4. (bonus, 30 points) Write a C++ class that implements all the functions of the ordered map ADT using a red-black tree. Your *main()* should also include code for visualizing your data structures before and after the operations.