UCR - CS 14

Assignment 3

Deliverables: Create a single pdf file that contains your answers and your C++ code. Then create a zip file that contains this pdf file along with all your code source files. Submit this zip file in iLearn.

Deadline: 10/24/2019 11:59 pm.

Exercise 1

a. Create (write C++ code) PointerHeap class, which implements a Heap using pointers instead of using an array. Implement functions DeleteMin(…) and Insert(….). Use templates for type of object and Comparator to define comparison between two objects. Show an example of how you would use your class for an object of class IntCell (a class with just one integer member variable; hint: you need to implement Comparator for IntCell).
b. What is the big-Oh complexity of DeleteMin(…) and Insert(….)?

Exercise 2

a. Implement functions for insertion sort, quicksort, heapsort and mergesort that input an array of integers and sort it.
b. Write a program that generates random integer arrays (hint: use seed appropriately to avoid generating same sequences) of lengths 10, 100, 1000, 10,000, 100,000, 1000,000, and then sorts each using each of the sorting functions from (a), and measures the time. The program will repeat this process 30 times and will compute the average execution time for each (arraysize,sorting-function) pair, over these 30 iterations. Finally, the program will output all these numbers in a readable format, e.g., as a table.
c. Are your computed numbers reasonable given your knowledge of the asymptotic complexity of each sorting algorithm? Explain.