**CS4306 Algorithm Analysis**

Fall 2021

Department of Computer Science

Kennesaw State University

**Programming Assignment 3**

**Due Date: Thursday, September 30, 2021 (by 11:59pm)**

Report

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Maintain a Priority Queue Using Heap Data Structure (*Consider the Descending Order Of Elements*)

In this assignment we will work with some concepts such as priority queue and Heap.

A priority queue is a nomal queue where its elements are assigned a specific priority. It could be a larger number higher priority for max heap and smaller number higher priority for min heap.

The reason we could use heap data structure to create a priority queue because heap is a tree- based data structure. Also, we could implement max heap and min heap or min heap where the root of the tree is highest or lowest respectively. Therefore, in priority queue, we needs the highest / lowest priority elements and a heap has the highest/ lowest element which is stored at the root of the tree. Hence, priority queue is implemented using the heap data structure.

We know to create the heap the time complexity is O(logn) but minimum time taken for creating a heap is O(n) using Heapify.

Also, when condering the descending order of Elenments we use Priority Queue with the key : larger number higher priority. So we implefy a max heap.

We could use binary heap based priority queue to do sorting by enqueue all the elements that you want to sort and then dequeue one by one until there is no more element in the priority queue and since the priority queue is implement using binary heap so the time complexity of sorting method will be O(N\*logN).

The first n comes from the fact that we have to enqueue and dequeue as many times as the number of elements that we have and the log n comes from the binary heaf shift up and ship down operation.

The Code has a Main class and a PriorityQueue1 class that have methods such as enqueue, dequeue, shiftUp, shiftDown, parent, left, right and swap. Those methods are used to create a max heap from an array and implement priority queue.

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