

# CS 310 Summer 2020

## Homework 3

For problem 1, submit the pdf file on blackboard

For problem 2, **make sure your program can be executed. You will get 0 if it fails to run.** Submit your source code on blackboard.

1. (20) Given a target value and a sorted array, assuming no duplicates in that array. If the target is found in the array, return its index. If not, return where it should be inserted. Give a  $O(\log n)$  time algorithm. Example:  $\{2,5,8,10\}$ , target=5, return 1.  $\{2,5,8,10\}$ , target=6, return 2. (Give the code of the algorithm in Java or Python. No need to submit the source code file. Just submit the answer as a pdf file on blackboard.)
2. (80) Implement Priority Queue (pq) using max heap, all the elements are stored in the Integer array A, n indicates the size of pq. Let us assume the capacity of the pq is 10, you can see it from the main function the length of A is 10, you do not need to use dynamic array to enlarge its size. When  $n = 10$ , you can not insert anymore elements. In previous homework we use 0 to represent empty element, this time we use null. You should implement the following functions:
  - (a) buildheap(): build a heap from array A
  - (b) heapify(i): apply heapify on element A[i]
  - (c) insert(int x): insert x into pq
  - (d) int maximum(): returns the element of pq with the largest value
  - (e) int extract-max(): removes the element of pq with the largest value
  - (f) increase-value(i, val): increases the value of A[i] to the new value val
  - (g) decrease-value(i, val):decreases the value of A[i] to the new value val