Student Name: ______________________________ J#: ________________

CSC 228-60 Data Structures and Algorithms, Spring 2018

Instructor: Dr. Natarajan Meghanathan

Exam 3 (Take Home Part) Max. Points: 100

Due on: April 25th @ 9 AM, in-class for the 12 PM section CSC 228-60
Print this exam and answer in the space provided. Staple and submit in class at the above time.

Given an array of integers, do the following (SHOW ALL THE STEPS; just writing the final answer will get only ZERO):

(a - 15 pts) Construct a max heap of the array. Show the initial essentially complete binary tree and the transformation of the binary tree to a max heap via the reheapify operations at the indices of the internal nodes (as shown in the slides).

(b - 15 pts) Sort the max heap version of the array obtained from (a) to obtain a sorted array of integers. Show the structural changes in the max heap in each iteration.

(c - 7 pts) Transform the max heap of (a) to a binary search tree.

(d - 8 pts) For the binary search tree obtained in (c), determine the average number of comparisons for a successful search and the average number of comparisons for an unsuccessful search.

(e - 8 pts) Use the sorted array of (b) to construct a binary search tree.

(f - 7 pts) For the binary search tree obtained in (e), determine the average number of comparisons for a successful search and the average number of comparisons for an unsuccessful search.

(g - 7 pts) Construct a hash table of the given array using a hash function H(K) = K mod 5.

(h - 8 pts) For the hash table of (g), determine the average number of comparisons for a successful search and the worst case number of comparisons for an unsuccessful search.

(i - 25 pts) Consider the elements of the array assigned to you are known only one at a time. Construct a sequence of priority queues (as max heaps) with the insertion (enqueue) of one element at a time, as shown in the slides.

1	Biruk Abate	[6, 22, 1, 12, 19, 10, 1, 17, 17, 19, 15, 27]
2	Dakarai Armstead	[14, 6, 19, 16, 23, 2, 18, 4, 26, 23, 7, 1]
3	Deonte Buckner	[30, 20, 26, 6, 29, 3, 7, 25, 4, 1, 29, 27]
4	Nzefili Chukwuma	[11, 4, 18, 24, 18, 28, 12, 2, 14, 7, 27, 11]
5	Brunti Givens	[14, 3, 16, 22, 23, 24, 28, 17, 19, 15, 2, 16]
6	Kamera Gorden	[14, 18, 18, 11, 9, 12, 15, 28, 1, 26, 18, 11]
7	Damon Kirk	[3, 14, 21, 19, 27, 28, 4, 4, 28, 6, 29, 24]
8	Blair McIntosh	[25, 10, 7, 18, 11, 5, 15, 7, 17, 15, 30, 5]
9	Donald Parker	[20, 4, 7, 3, 3, 20, 12, 23, 10, 9, 26, 15]
10	Tavarez Stewart	[24, 2, 26, 9, 17, 25, 18, 13, 8, 4, 29, 30]
11	Tanisha Thompson	[2, 6, 14, 22, 1, 10, 18, 10, 15, 1, 21, 27]
12	Bryan Williams	[5, 29, 24, 16, 20, 3, 8, 20, 15, 12, 8, 5]

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