CSci 242: Algorithms and Data Structures **Fall, 2019**

Instructor: Dr. M. E. Kim Date: October 9th, 2019

Due: 5 PM, October 15th (Tue.), 2019. Name: Elena Corpus

**Home Assignment 3B: 40 points (optional) 34/40**

Q7. [24] **Minimum Heap**

In the array A[1..10] that stores the elements [35, 30, 25, 27, 22, 20, 18, 15, 10, 5],

1. ***Construct*** a ***min-heap*** in the array A. Draw the final heap and show its content in the array A. During the construction of heap, show each step of heap construction.

Original

35

30. 25

27. 22. 20. 18

15. 10. 5

Min-heap

5

10. 18.

15. 22. 20. 25

35. 27. 30.

A[1...10] = [5, 10 ,18, 15, 22, 20, 25, 35, 27, 30]

Correct answer is [5, 10, 20, 18, 15, 30, 22, 35, 25, 27]

1. Draw the min-heap after ***removing the Minimum key*** from 1) and show its content in the array A.

Min-heap

5

10. 18.

15. 22. 20. 25

35. . 27. 30.

Removing key 5 ;

10

15. 18

27. 22. 20. 25

35. 30

A[1...10] = [10, 15, 18, 27, 22, 20, 25, 35, 30]

Correct answer is [ 10, 15, 20, 18, 27, 30, 22, 35, 25]

1. From the min-heap in 2), ***sort t***he array A in the ***descending*** order. Draw the heap and show the content of array A *after sorting five smallest keys.*

*35*

*30. 27*

*25 22 20 18*

*15 10*

A[1..9] = [35, 30, 27, 25, 22, 20, 18, 15, 10]

*Correct answer is* A = [22, 25, 30, 35, 27 | 20, 18, 15, 10, 5]

Or A = [25, 27, 30, 35 | 22, 20, 18, 15, 10 | (5)]

Q8. [10] **Heap Sort**

A maximum heap is used to sort an array A of length *n* in ascending order.

What is the running time of Heap-Sort algorithm on an array A that is already sorted in ascending order? Explain your answer.

O(n log n) is the running time of Heap-Sort algorithm on an array A. This is because building a heap will have a running time of O(n), and then ascending down the heap/array will have a run time of O(log n).