150015-Semester II - 5781

Data Structures I

**Homework Assignment #8**

**Question 1**

In class we learnt to different algorithims for creating a heap. Given an array containf n distinct numbers (no repates) as input, will the two algorithims produce the same heap? If yes, prove it. If they do not produce the same heap, prove that they do not. And if for a certain array it produces the same heap and for other arrays it does not, give an example that does and an example that does not.

**Question 2**

Run the heapsort algorithim on the following array. Show the intermideate stages.

**Question 3**

1. Write an efficient algorithim that accepts an array of size *n* and determines if it is a min-heap.
2. What is the run-time complexity of your algorithm in the worst-case? Explain.

**Question 4**

Write an algorithim that accepts a max-heap with *n* elements, and index *i* of some element in the heap, and *m* a natrual number. The algorithim should add *m* to all the element in the sub-tree whose root is *i*, and returns the updated heap. The needed run-time complexity is O(n).

**Question 5**

Given: a max-heap with n distinct (no repeats) elements implemened in an array.

a. At what indexes in the array could you find the the smallest value of the heap? Prove your answer.

b. At what indexes in the array could you find the the second greatest value value of the heap? Prove your answer.

**Question 6**

How can you implement a regular queue using a priority queue?