

COMP 6481: Programming and Problem Solving

Tutorial 7:

Priority Queue, Heaps, Maps, Trees

- Illustrate the execution of a Bottom-Up construction of a heap on the following sequence:

(2,5,16,4,10,23,39,18,26,15,7,9,30,31,40)

- ▶ Give an algorithm for changing the value of an arbitrary element from a heap of size N . Determine worst-case time complexity of your algorithm. You may describe your algorithm in English.

- ▶ At which nodes of a heap can an entry with the largest key be stored?

- ▶ Bill claims that a preorder traversal of a heap will list its keys in nondecreasing order. Draw an example of a heap that proves him wrong.

- Let T be a complete binary tree such that node v stores the entry $(p(v), 0)$, where $p(v)$ is the level number of v . Is tree T a heap? Why or why not?

- Explain why the case where node r has a right child but not a left child was not considered in the description of down-heap bubbling.

- Is there a heap T storing seven entries with distinct keys such that a preorder traversal of T yields the entries of T in increasing or decreasing order by key? How about an inorder traversal? How about a postorder traversal? If so, give an example; if not, say why.

- ▶ Write a program to sort the set of strings based on the length of the string using priority queue and print each of the string value. Custom strings to be added to the PQ while inserting the elements in the PQ.

- ▶ Create order class with orderId and orderAmount attributes with capabilities to compare the objects based on orderId. Create 3 objects of this class and insert them into PQ. Retrieve all the objects based from the PQ to make sure that they are sorted based on orderId.

➤ Which of the following maps maintains the insertion order in java?

a) HashMap

b) TreeMap

c) **LinkedHashMap**

d) Hashtable

➤ Which map can be used to maintain the order based on the key?

a) HashMap

b) TreeMap

c) LinkedHashMap

d) Hashtable

- ▶ Write a car class with attribute `color:String` which can act as key to `TreeMap`.