BRAC University (Department of Computer Science and Engineering)

CSE 220 (Data Structures) for Fall 24

Quiz 5

Student ID: **Section:** **Full Marks: 15**

Name: **Duration: 30 minutes**

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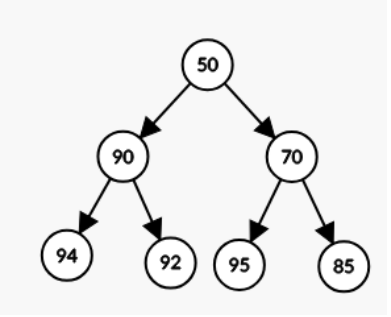
1. Determine whether the following arrays represent any heap or not. Determine what type of heap (max or min or both) it can be if that's a heap. 1 x 4 = 4
   a. [33, 55, 41, 66, 59, 62]
   b. [10, 10, 10, 10]
   c. [12, 15, 71, 57, 22, 70]
   d. [95, 61, 88, 31, 39, 31, 7, 87]
2. Simulate the following operations sequentially on the given Min Heap: [Draw a tree after each modification] 2 x 2 = 4
   a. ExtractMin()
   b. Insert(65)



3. Given an array and an integer **K**, For each part of the array starting from the beginning (called a **prefix**), find the K-th smallest number. If the prefix has fewer than K numbers, print -1.

   NOTE:
   a. A **Prefix** refers to the initial portion of the array that includes the first ***i*** elements.
   b. You can not use any data structure other than a Max Heap.
   c. You can assume the implementation of **Max_Heap** Class is given with **ExtractMax() and Insert()** functions.
   d. Hint: Keep track of a certain number of elements in your Heap. 7

Sample Input	**Sample Output**	**Explanation**
Array = [7, 4, 6, 3] K = 2	-1 7 6 4	Prefix = [7] → Less than 2 numbers → Print -1 Prefix = [7, 4] → The 2nd smallest is 7 → Print 7 Prefix = [7, 4, 6] → The 2nd smallest is 6 → Print 6 Prefix = [7, 4, 6, 3] → The 2nd smallest is 4 → Print 4
Array = [5, 1, 3, 8, 2] K = 3	-1 -1 5 5 3	Prefix = [5] → Less than 3 numbers → Print -1 Prefix = [5, 1] → Less than 3 numbers → Print -1 Prefix = [5,1,3]→ The 3rd smallest is 5 → Print 5 Prefix = [5,1,3,8]→ The 3rd smallest is 5 → Print 5 Prefix = [5,1,3,8,2] → The 3rd smallest is 3 → Print 3

Python Notation	**Java Notation**

`def printKth(array, k):`
`  # Your Code Here`
	`void printKth(int[] array, int k){`
	`  # Your Code Here`
	`}`