

## **CSE 204 (Data Structures and Algorithms I Sessional)**

**July 2022 Term**

**Offline: Binary Heap**

**Deadline: January 13 (Friday), 11:59 pm**

### **Problem Specification**

In this assignment, you have to implement a Min Heap using the array data structure. The min heap will support the following operations.

### **Operations**

1. **FindMin()** : Returns the minimum key.
2. **ExtractMin()** : Returns the minimum key and deletes it from the heap
3. **Insert(key)** : Inserts a new key in the heap.
4. **DecreaseKey(prevKey, newKey)** : Decrease the value of the specified key to a new value (i.e., the prevKey will be decreased to newkey ). You may safely assume that the input will not contain duplicate keys, and  $\text{newKey} < \text{prevKey}$
5. **Print()** : Prints the level order traversal of the heap.

### **Input/output**

You will take input from a text file where each line will specify one of the aforementioned operations. The operations are denoted by the first three letters, e.g., 'INS' indicates the Insert(key) operation, 'FIN' indicates the FindMin operation, etc. Then the operands will follow where necessary. You can assume that all the operands will be integers. See the Sample I/O for further clarifications. You have to print the output to a text file.

### **Submission guidelines and other instructions**

You are already aware of the submission guidelines and policies regarding plagiarism from your previous offline assignments. Please strictly follow them.

## Sample Input/Output

Input	Output
INS 7	INSERTED 7
INS 10	INSERTED 10
INS 5	INSERTED 5
PRI	Printing the binary heap ...
INS 12	- - - - -
INS 15	Level 0: 5
PRI	Level 1: 10 7
DEC 15 3	- - - - -
PRI	INSERTED 12
FIN	INSERTED 15
EXT	Printing the binary heap ...
PRI	- - - - -
	Level 0: 5
	Level 1: 10 7
	Level 2: 12 15
	- - - - -
	15 decreased to 3
	Printing the binary heap ...
	- - - - -
	Level 0: 3
	Level 1: 5 7
	Level 2: 12 10
	- - - - -
	FindMin returned 3
	ExtractMin returned 3
	Printing the binary heap ...
	- - - - -
	Level 0: 5
	Level 1: 10 7
	Level 2: 12
	- - - - -