BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CSE208 (Data Structures and Algorithms II Sessional)
July 2021 Term
Offline: Binomial Heap
Deadline: January 26, 2022, 6:00 AM

1. Problem Specification

In this assignment, you have to implement a Max Priority Queue for an Eye Bank. **You have to implement the Max Priority Queue with Binomial Heaps**. For the mentioned eye bank, patients who are in need of cornea transplants are assigned a priority value (key) by the doctors and based on the priority value, they are inserted into the priority queue. Whenever a donor donates his/her eye, the person with the highest priority is selected for the transplant. If a patient's medical condition deteriorates, his/her priority can be increased. In summary, the priority queue should support the following operations.

1. FindMax(): Returns the node having the maximum key.
2. ExtractMax(): Returns the node having the maximum key and deletes it from the heap.
3. Insert(node): Inserts a new node in the heap.
4. Increase-Key(prevKey, newKey): Increase the value of the specified key. You may safely assume that the input will not contain duplicate keys.
5. Print(): Prints the level order traversal with level no. of each of the binomial trees in the heap.

2. 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.. 'FIN' indicates Find-Max operation, 'INS' indicates Insert operation, and so on. Then the required operands will follow where necessary. You can assume that all the operands will be integers. You have to print the output to the console.

3. Special Instructions

Please **DO NOT COPY** solutions from anywhere (your friends, seniors, internet, etc.). **Any form of plagiarism (irrespective of source or destination), will result in getting -100% marks in this assignment.**

4. Submission Guideline

a. Create a directory with your 7 digit student ID as its name.
b. Put the source files only into the directory created in step (a).
c. Zip the directory (compress in .zip format; .rar, .7z or any other format is not acceptable).
d. Upload the .zip file to Moodle

For example, if your student id is 1805xxx, create a directory named 1805xxx. Put only your source files (.c, .cpp, .java, .h, etc.) into 1805xxx. Compress the directory 1805xxx into 1805xxx.zip and upload the 1805xxx.zip to Moodle.

5. Sample I/O

Input	Output
| ```
INS 7
INS 12
INS 19
INS 5
INS 16
INS 6
PRI
INC 7 27
PRI
FIN
EXT
EXT
PRI
``` | ```
Inserted 7
Inserted 12
Inserted 19
Inserted 5
Inserted 16
Inserted 6
Printing Binomial Heap...
--------------------------
Binomial Tree, B1
Level 0 : 16
Level 1 : 6
Binomial Tree, B2
Level 0 : 19
Level 1 : 12 5
Level 2 : 7
--------------------------
Increased 7. The updated value is 27.
Printing Binomial Heap...
--------------------------
Binomial Tree, B1
Level 0 : 16
Level 1 : 6
Binomial Tree, B2
Level 0 : 27
Level 1 : 19 5
Level 2 : 12
--------------------------
FindMax returned 27
ExtractMax returned 27
ExtractMax returned 19
``` |

```
Printing Binomial Heap...
---------------------------
Binomial Tree, B2
Level 0 : 16
Level 1 : 12 6
Level 2 : 5
---------------------------
```