CSC 530/730 – Programming and Data Structure
Homework 5
(100 points)

Problems

In this homework assignment, you will make necessary changes to the example project *Example16Heap* and provide functions in class `Heap` to implement basic heap operations, including

- Read non-negative integers from the user and use them to build a heap
- Display the heap using the breadth-first traversal so that nodes in different levels will be printed in different lines
- Insert a new node into the heap
- Remove the largest node from the heap
- Search the heap for a specified key and print the index of the key in the array

For this project, let's assume keys in the heap are distinct.

In addition, you will also write necessary statements in `main()` function to allow users to choose from a menu of options and manipulate the heap. Here are some examples when running the Homework 5 project.

```
Select from:
1. Read items and build heap
2. Display heap
3. Insert a node
4. Remove the largest node
5. Search for a key
0. Exit
1
Enter integers(negative to stop): 72 23 71 53 95 81 39 34 6 38 -1

Select from:
1. Read items and build heap
2. Display heap
3. Insert a node
4. Remove the largest node
5. Search for a key
0. Exit
2
Heap:
95
72 81
53 38 71 39
34 6 23

Select from:
1. Read items and build heap
2. Display heap
```

```
3. Insert a node
4. Remove the largest node
5. Search for a key
0. Exit
3
Enter a non-negative integer to be inserted: 85

Select from:
1. Read items and build heap
2. Display heap
3. Insert a node
4. Remove the largest node
5. Search for a key
0. Exit
2
Heap:
95
85 81
53 72 71 39
34 6 23 38

Select from:
1. Read items and build heap
2. Display heap
3. Insert a node
4. Remove the largest node
5. Search for a key
0. Exit
4

Select from:
1. Read items and build heap
2. Display heap
3. Insert a node
4. Remove the largest node
5. Search for a key
0. Exit
2
Heap:
85
72 81
53 38 71 39
34 6 23

Select from:
1. Read items and build heap
2. Display heap
3. Insert a node
4. Remove the largest node
5. Search for a key
0. Exit
5

Enter the key to be searched for: 71
```

```
71 found at index 5

Select from:
1. Read items and build heap
2. Display heap
3. Insert a node
4. Remove the largest node
5. Search for a key
0. Exit
5

Enter the key to be searched for: 25
25 NOT found

Select from:
1. Read items and build heap
2. Display heap
3. Insert a node
4. Remove the largest node
5. Search for a key
0. Exit
0
Thanks for using my program.
```

Submission

Compress the JAVA project folder into a *.zip* file and submit it on Blackboard.