

# COP 3530 Data Structure and Algorithm Analysis

## Homework 5

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In this assignment, you are given several classes in the cpp file “Beap.cpp”. Your task is to complete the implementation of the classes specified as below. You need to submit the following two files:

- A *single* cpp file that contains everything about your source code. It must be compilable and executable. Do not submit things irrelevant (such as .exe).
- A *single* pdf file that describes your methods and analysis.

You can discuss with anyone, but you should **write your own** code and writeup. In the pdf document, you **must** mention/acknowledge all people that you have discussed with. For example, you can say Idea A was from the discussion with Person B. Details are described below.

### 1 Your Task

You are given a class “TNode” that contains one integer value, and three pointers – one to the parent, one to the left child, and one to the right child. You need to complete the class “BTree” and two other functions specified in the cpp file.

**Task 1:** Implement the constructors (default and copy) of Heap. You need to make sure that the copy constructor makes a separate copy of the heap.

**Task 2:** Implement in, removemin, getmin. Note:

- getmin returns the pointer to the min element, but do not modify the heap. On the other hand, removemin just deletes the min element from the heap.
- In this homework, I request that the in function takes input “const Node  $t$ ”, which means you cannot modify the input node  $t$ . You should create a new node (different from the input node  $t$ ) and then add into the heap.
- It is highly recommended to write helper functions, such as bubble-up and bubble-down. If you don’t know what I am talking about, you should review heap.

**Task 3:** Implement Heapify that takes input a binary tree, and makes a heap from the binary tree. Here your binary tree is in the array form. You cannot modify the array.

**Task 4:** Implement Heapsort that takes input an array of size  $n$ , and returns a sorted array.

**Task 5:** Design a test function. Test everything!

**Task 6:** Write a doc/pdf file that describes your ideas and thoughts.