

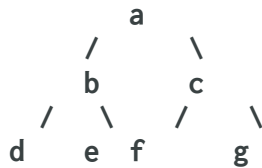
CS2010 Lab 5

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Question 1

Definition 1



Definition 2



Question 2

There are two cases.

- Minimum case: h is odd
- Maximum case: h is even.

Let the function calculating sum of nodes from $h = 1$ is defined as

$$nodes(k) = \frac{a(2^n - 1)}{2 - 1} = a(2^n - 1)$$

Minimum case

$$Number_of_nodes = nodes(h) - nodes(floor(\frac{h}{2})) = a(2^h - 2^{ceiling(\frac{h}{2})})$$

Maximum case

$$Number_of_nodes = nodes(h) - nodes(\frac{h}{2}) = a(2^h - 2^{\frac{h}{2}})$$

Question 3

Remove the rightmost (largest) element from the right subtree of the deleted node, and replace it at position k.

Bubble down the tree from the $a[k]$ element. This means re-establishing the heap property by bubbling down stack, doing comparisons and swapping elements until the children is smaller than the inserted element.

Terminate program.

Question 4

Part A

Such files are where the variance of frequency of characters is high, such that the most commonly used key is used highly. An example is a text file with lots of whitespace.

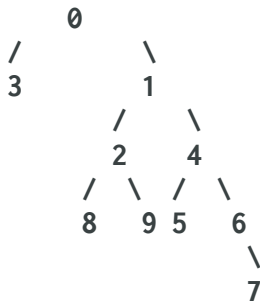
Part B

Such files are where the variance of frequency of characters is low, such that the most commonly used key is not used as frequently with respect to the rest of the characters

Question 5

- a. $O(n \log n)$
- b. $O(n \log n)$
- c. $O(n)$
- d. $O(n \log n)$
- e. $O(n * n^2)$ since it is quicksort worst case (inserted back)

Question 6



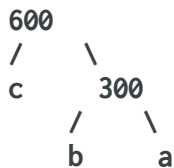
Question 7

```
public class CustomComparator implements Comparator {  
    public int compare(Object o, Object t1) {  
        C a1 = (C) o;  
        C a2 = (C) t1;  
        return a1.compareTo(a2);  
    }  
}
```

Question 8

(3)

Question 9



Question 10

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