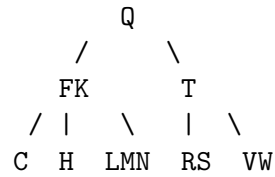


CS161 - Homework 3
Due: Thursday July 16, 5pm

1. (5 points) Of the sorting algorithms we've seen so far (INSERTIONSORT, MERGESORT, QUICKSORT, BUBBLESORT and HEAPSORT), which are amenable to "on-disk" sorting, where the data is too large to fit in memory. Briefly explain your answers.
2. (5 points) CLRS 10.1-6 (pg. 204)
3. (5 points) CLRS 6-1a (pg. 142). Note this is a comparison of the two heap building procedures discussed in class.
4. (10 points) Suppose that in addition to the child pointers, we also want to keep track of the total number of nodes in the subtree rooted at a node with a field denoted *keys*.
 - (a) (5 points) Modify BSTINSERT to correctly keep track of *keys*. Does this change the running time?
 - (b) (5 points) Given the additional field, write pseudocode for a procedure BSTKEYLESTHAN(T, k) that takes a tree T and a number k and returns the number of keys in T that are less than k . What is the worst case running time of your procedure?
5. (3 points) The professor calls in sick and has asked you to play professor for a day. He wants you to write a question that tests student's knowledge about heaps. The question should take approximately 10 minutes for an average student to do, but should reinforce key concepts covered in class regarding heaps. Also provide the solution to your question. Points will be awarded for creativity, knowledge tested and how well the question fits the above criterion.
6. (5 points) CLRS 12.2-4 (pg. 260)

7. (3 points) Given the B-Tree below with minimum degree 2, draw the tree that results from inserting 'P', 'A', 'B':



8. (8 points) CLRS 18.2-6 (pg. 449). Note: $lg = \log_2$.

Extra Credit

9. (3 points) If we insert the numbers 1 to 10 into a binary search tree, what is the probability that the tree will have a 3 as the left child of the root and a 7 as the right child of the root assuming all permutations of the numbers are equally likely?

Just for fun

10. CLRS 12-1 (pg. 269)

Optional

I'm trying to get some feedback about the class, including the material, lectures, pace, etc. This will have absolutely no impact on your grade. If you prefer, you may answer these on a separate sheet of paper with no name and hand it in. I will take all feedback seriously and will try and alter things appropriately for the rest of the quarter.

1. How much of the material so far has been reviewed?
2. How is the pace of the class? Too fast? Too slow?
3. Is there any material not currently on the syllabus that you'd like to hear about?
4. How is the difficulty of the homeworks? Too hard? Too easy?
5. Any feedback about the lecture? What you'd like to see more of? Less of?
6. Is the book understandable.

7. Do you use and find useful the lecture notes online?
8. Any other comments/concerns about the class/instructor/TA?