The due date for this quiz is Sun 26 Oct 2014 11:59 PM PDT.

✓ In accordance with the Coursera Honor Code, I (Rahul Revo) certify that the answers here are my own work.
Thank you!

Question 1

3-way-Merge Sort : Suppose that instead of dividing in half at each step of Merge Sort, you divide into thirds, sort each third, and finally combine all of them using a three-way merge subroutine. What is the overall asymptotic running time of this algorithm? (Hint: Note that the merge step can still be implemented in O(n) time.)

- \bigcap $n(\log(n))^2$
- \bigcap $n^2 \log(n)$
- \bigcirc n

Question 2

You are given functions f and g such that f(n) = O(g(n)). Is

 $f(n) * log_2(f(n)^c) = O(g(n) * log_2(g(n)))$? (Here c is some positive constant.) You should assume that f and g are nondecreasing and always bigger than 1.

- \bigcirc Sometimes yes, sometimes no, depending on the constant c
- True
- \bigcirc Sometimes yes, sometimes no, depending on the functions f and g
- False

Question 3

Assume again two (positive) nondecreasing functions f and g such that f(n) = O(g(n)). Is $2^{f(n)} = O(2^{g(n)})$? (Multiple answers may be correct, you should check all of those that apply.)

- Sometimes
- Always
- Never

Question 4

k-way-Merge Sort. Suppose you are given k sorted arrays, each with n elements, and you want to combine them into a single array of kn elements. Consider the following approach. Using the merge subroutine taught in lecture, you merge the first 2 arrays, then merge the 3^{rd} given array with this merged version of the first two arrays, then merge the 4^{th} given array with the merged version of the first three arrays, and so on until you merge in the final (k^{th}) input array. What is the running time taken by this successive merging algorithm, as a function of k and k? (Optional: can you think of a faster way to do the k-way merge procedure?)

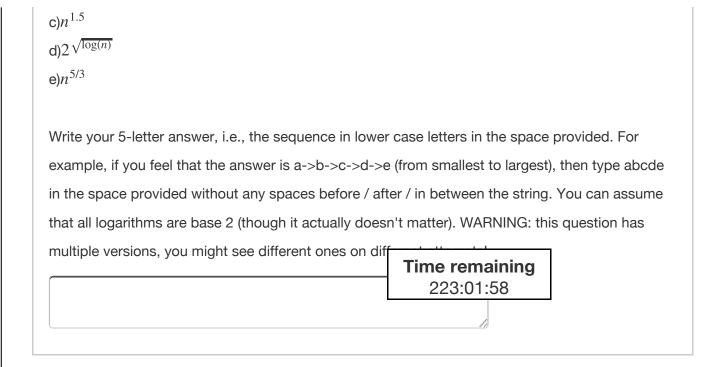
- $\theta(n\log(k))$
- $\Theta(nk^2)$
- $\Theta(n^2k)$
- $\theta(nk)$

Question 5

Arrange the following functions in increasing order of growth rate (with g(n) following f(n) in your list if and only if f(n) = O(g(n))).

a) \sqrt{n}

b) 10^n



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