

## Homework Assignment 3

MCS/CS 401 Computer Algorithms I

due on Friday, 07/08/2022 at 11:59 PM

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Tag all questions on Gradescope after submitting the PDF file!

Read Chapters 10, 12 and 15 thoroughly and solve the following problems.

**Problem 1.** *Construct a non-recursive procedure capable of reversing a single linked list of  $n$  elements, which runs in  $O(n)$  time. Can the same be achieved in  $\Omega(n)$  time? If so, construct it.*

**Problem 2.** *Using the procedure TREE-SUCCESSOR and TREE-MINIMUM, write a function  $F(x)$ , where  $x$  is a node in a binary search tree, to produce the output that INORDER-TREE-WALK function would produce. Determine the upper bound running time complexity of  $F(x)$  and prove its correctness.*

**Problem 3.** *Let  $n$  be an integer. Write dynamic programming algorithm which determines in how many ways, with repetitions, can  $n$  be written as the sum of 1,2,4 and prove its time complexity.*

**Problem 4.** *Determine, citing valid reasons, why memoization fails to improve the MERGE-SORT's time complexity.*

**Problem 5.** *Write a dynamic programming based version of the factorial function and prove its time complexity.*

## Assignment Guidelines and Plagiarism Warning

This assignment will consist of 5 Problem and it is due on **Friday, 07/08/2022 at 11:59 PM!**

Your solution of this assignment must consist of a single, continuous PDF file, which you will upload to Blackboard-Gradescope on or before the above specified deadline.

This assignment must be solved **individually**. Under no circumstances are you allowed to copy or to collaborate with anyone else. **All submitted files will be automatically checked for plagiarism.** Regardless of who copied from whom, all caught in the act of plagiarism will be penalized, as specified in the course syllabus.

In particular, using internet resources of any kind is **not** allowed. Internet sites are routinely checked for similarity to your submission for content. Changing order or variable names will not prevent plagiarism detection. In addition, do not post any content of this assignment to any internet sites or make it public in any other form. **The content of this assignment is not in the public domain!**

You are free, however, to use our course resources, such as lecture notes and our text book, during the solving of this assignment. If you have questions about this assignment come to my online office hours, or those of the Teaching Assistants, using the usual Blackboard link.