CSI - 3105 Design & Analysis of Algorithms
Fall 2019

Assignment #1
Deadline: Tuesday, September 24, 2019
before 10:00 AM (to be delivered in my hands)

Note: Make sure your handwriting is readable, otherwise your assignment will not be marked.

1. (10 marks) Assume that $n = 4^k$, where k is a positive integer, and solve the following recurrence by unfolding.

$$T(n) = \begin{cases} 1 & \text{if } n = 1, \\ 8\,T\left(\frac{1}{4}n\right) + 14126 & \text{if } n \geq 2. \end{cases}$$

   Your final answer must be an exact formula in terms of n. Your final answer must be simplified as much as possible. You must provide all details of your solution.

2. (10 marks) Design a deterministic algorithm to solve the following problem.

   input: An array $A[1..n]$ of n integers.

   output: Two different indices i and j such that $A[i] = A[j]$, if such indices exist. Otherwise, return **NONE**.

   Your algorithm must take $O(n \log(n))$ time. You must describe your algorithm in plain English (no pseudocode) and you must explain why the running time of your algorithm is $O(n \log(n))$.