

EECS 3101 WINTER '19: DESIGN AND ANALYSIS OF ALGORITHMS

Assignment 1

Weight: 3%, Due: Jan 22, 11:59 pm

Notes:

1. The assignment MUST be typed, and submitted as a .pdf file.
2. Use the moodle link to submit your assignments. No late submissions will be accepted. Please do not send files by email.
3. You must do this assignment individually.
4. Submit this assignment only if you have read and understood the policy on academic honesty on the course web page. If you have questions or concerns, please contact the instructor.

Problem 1

[5 points] There is an array $A[1..n]$ of integers. You have to compute an array $B[1..n]$ such that $B[i] = \prod_{j=1, j \neq i}^n A[j]$. Write down the pseudocode for an iterative algorithm that solves it in linear time, without using the division operator. Prove its correctness using loop invariants. You can ignore overflow issues.

Problem 2

[5 points] Suppose you are asked to sort, in linear time, and in-place, an array containing keys 5 and 10 only; e.g., 5, 10, 10, 10, 5, 5, 10. Write pseudocode for an algorithm that solves this problem, and prove it correct (using loop invariants).

Problem 3

[5 points] What is the value returned by the following function? Express your answer as a function of n and compute the running time using the tabular method from the book. Finally, express the worst case running time using $\Theta()$ -notation,.

```
MYSTERY( $n$ )
1   $r = 1$ 
2  for  $i = 1$  to  $n$ 
3      for  $j = i + 1$  to  $n$ 
4           $r = 4r$ 
5  return  $r$ 
```