Homework #3
Algorithms I
600.463
Spring 2017

Due on: Thursday, Feb 23rd, 5pm
Late submissions: will NOT be accepted
Format: Please start each problem on a new page.
Where to submit: On Gradescope under HW3.
Please type your answers; handwritten assignments will not be accepted.
To get full credit, your answers must be explained clearly,
with enough details and rigorous proofs.

February 16, 2017

1 Problem 1 (20 points)

Suppose an array $A[1 \dots n]$ of n elements, each of which is *red, white,* or *blue*. We want to sort the elements so that all the *reds* come before all the *whites*, which come before all the *blues*. The only permitted operations on the keys are:

- $Examine(A, i)$ — report the color of the ith element of A.
- $Swap(A, i, j)$ — swap the ith element of A with the jth element.

Design an efficient algorithm for the sorting. Prove the correctness and analyze the running time. A linear-time solution is expected.

2 Problem 2 (20 points)

Assume that the array $A[1 \dots n]$ only has numbers from $\{1, \dots, n^{64}\}$ but that at most $\log \log n$ of these numbers ever appear. Design an algorithm that sorts A substantially less than $O(n \log n)$ time.