

CS2223 HW#1

DUE: Tuesday, November 4

1 (6 points) Determine the time to execute an increment instruction (for example, the time to execute a $k++$ if you're working in C). Describe your platform (computer and compiler), and how you determined your answer.

2 (8 points) Consider a sequence $\sigma \in \{\text{HEAD}, \text{TAIL}\}^{200}$ of 200 independent flips of a fair coin. What is the expected number of contiguous subsequences of five HEADs or five TAILS in σ ? Note that the subsequence HEAD,HEAD,HEAD,HEAD,HEAD,HEAD,HEAD counts as three subsequences of length five. Either compute this number analytically or use some simulation to estimate it. Describe how you determined your answer.

3 (3 points) (This problem is lifted from Manber's *Introduction to Algorithms, A Creative Approach*; we will generalize your solution when we discuss dynamic programming) Consider the following list of numbers. What is a longest (not necessarily contiguous) increasing subsequence? It corresponds to the fewest numbers you can erase such that the remaining numbers are in increasing order. For example, erasing all but the first two numbers leaves the increasing sequence (9 44); erasing all but the first, third, sixth and eight yields the longer sequence (9 32 42 92).

9 44 32 12 7 42 34 92 35 37 41 8 20 27 83 64 61 28 39 93 29 17 13 14 55 21 66 72 23

73 99 1 2 88 77 3 65 84 82 62 5 11 74 68 76 78 67 75 69 70 22 71 24 25 26