SSN College of Engineering

Department of Computer Science and Engineering

CS1403 — Design and Analysis of Algorithms

2019 – 2020

Session — 02

January 4, 2020

- This homework is due by 4pm on January 04, 2020

- Grace period is given up to midnight of January 05, 2020

- You can upload only one ZIP file

- The naming convention is "<Your first name (first letter capital and all the other letters small)>-CS1403-S02.zip"

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1. Consider the following problem discussed in the class.

    - Given a sequence of integers $\langle a_1, a_2, \cdots, a_N \rangle$, find the maximum value of

    $$\sum_{k=i}^{j} a_k$$

    for some (i, j) range within the bounds of the sequence.
    - You may assume that sum may be reported as 0 whenever it goes negative
    - An instance: $\langle -2, 11, -4, 13, -5, -2 \rangle$
    - Answer? 20

    (a) Design and implement an algorithm using brute-force examination of all possible sub-sequences

    (b) Implement an improved version using dynamic programming to compute the sum of a sub-sequence

    (c) Implement a third version that does not examine all the sub-sequences

    (d) Perform empirical analysis of run time of all the three versions: Execute the functions for different values of sequence size n and tabulate the results (note that each entry should be an average over several runs, say m). Perform ratio analysis with well known complexity classes to confirm the growth rate of running times of all the three versions.

    (e) (OPTIONAL) Predict running times (in suitable units) for very large values of n that are not in your table. Execute and find real running times for those values of n (average over several runs). What is your prediction error? Use paired t-test to show that deviations in your predictions are not significant.