Algorithm Design and Analysis
CSE222 Winter '20

Quiz 2

Time 37 mins.

Please write solutions independent of each other. This is a closed book test. You can not use books or lecture notes.

Problem 1 (10 points)

Mr Monkey is standing in front of a row of banana trees on Skull Island which actually belong to his rival King Kong. The banana trees are unusually high on that island. He wants to steal as many bananas as possible. Here is his plan. He will climb up one of the trees and then keep jumping from one tree to the immediately next one, while collecting all the bananas from each of them. But he will not switch the direction of his jumps. No longer being the agile young monkey he once used to be, he can only jump a total distance of L, after which he will climb down and run away before Kong crushes his head.

Let the trees be labelled as $t_1, t_2, \cdots t_n$. Let $v_i, \forall i = 1, 2, \cdots n$ be the number of bananas in tree t_i. Further, let $\ell_i, i = 1, 2, \cdots n-1$ denote the distance between the trees t_i, t_{i+1}.

Can you write an algorithm to help Mr. Monkey steal as many bananas as possible ? Your algorithm should be a polynomial in n, L. Please show all the steps of DP as in the sample solution - **subproblem definition, recurrences, pseudocode, runtime** .

(Statutory Warning : The author of this problem does not endorse stealing. The story is a work of fiction with no intentional resemblance to any character living or dead)