

Design and Analysis of Algorithms

Problem #1

You are given a list of unique numbers that were sorted in ascending order but then rotated. For example, [15, 22, 5, 6, 9, 10]. Write an $O(\log n)$ algorithm to find the "rotation point" which is the index of the smallest number in the list given that list does not contain any duplicates.

Problem #2

Given two DNA sequences:

Sequence 1: "AGGTAB"

Sequence 2: "GXTXAYB"

- a) Construct a Longest Common Subsequence (LCS) table to find the maximum length and value.
- b) Write the algorithm to find the Longest Common Subsequence (LCS)

Problem #3

A network is represented as an undirected graph $G = (V, E)$; Where, V representing computers in the network and E representing the connections between them. A malware infection is detected at time t_0 in a node $v_0 \in V$. At each time step t_{i+1} , the malware spreads to all computers directly connected to any infected computer. Write an algorithm to compute the minimum number of time steps T required for the malware to propagate to every node in the graph.