

Lab Assignment 04

Task 1: Consider that you are provided a 8×8 table of natural numbers. Suppose that in any step you are allowed to either double each of the numbers in any one row, or subtract 1 from each of the numbers in any one column of the table. Write a program which translates the given original table into a table of all zeros. Determine the running time complexity of your devised algorithm?

Task 2: Assume a given pattern string $P[1..m]$ and a text string $T[1..n]$ where $n \geq m$. We say that pattern P occurs with shift s in text T if $0 \leq s \leq n-m$ and $T[s+1..s+m] = P[1..m]$. This classic problem is known as Pattern Matching problem. Hence, if P occurs with shift s in text T , then we call s a valid shift, otherwise we call s an invalid shift. Now implement an algorithm to find all valid shifts with which a given pattern P occurs in a given text T . For example if pattern is "DAA" and text string is "SampleTestProgramTest", then two instances of pattern appears in text at shift $s=6$ and $s=17$.

Task 3: Write a program to generate a random connected graph on V vertices by generating random pairs of integers between 1 and V . You estimate how many edges are needed to produce a connected graph as a function of V .

Task 4: Consider the maximum subsequence sum problem which may be defined as: Given an array $X[1..n]$ of natural numbers find values of i and j with $1 \leq i \leq j \leq n$ such that $\sum_{k=i}^j X[k]$ is maximized. Design and implement the efficient algorithm for the given problem.

For example: $X[] = \{5 \ 10 \ -20 \ 15 \ -20 \ 8 \ 4 \ 1 \ 2 \ -1\}$. Three subsequences of maximum sum of 15 are: $X[0:1]$, $X[3:4]$ and $X[5:9]$.