LAB - 7

Dynamic Programming

(Matrix Chain Multiplication, Longest Common Subsequence)

PROGRAM EXERCISE

Lab. Exercise (LE)

7.1 Write a C program to implement the Longest Common Subsequence.

Sample Inputs & outputs

The LCS of HUMAN and CHIMPANZEE is HMAN

7.2 Write a program to implement the matrix chain multiplication problem using M-table & S-table to find optimal ordering of matrix multiplication.

Home Exercise (HE)

7.3 Write a program to find the Longest palindromic subsequence (Hint: Subsequence is obtained by deleting some of the characters from a string without reordering the remaining characters, which is also a palindrome).

7.4 Given n elements input through keyboard, write a program that prints the length of the longest increasing subsequence whose adjacent element difference is one.

Exact Input/output Sample-1

Enter maximum size of array: 10
Enter 10 integers (separated by space): 3 10 3 11 4 5 6 7 8 12
The longest increasing subsequence whose adjacent element differs by one: {3, 4, 5, 6, 7, 8}
The length of increasing subsequence: 6

Exact Input/output Sample-2

Enter maximum size of array: 8
Enter 8 integers (separated by space): 6 7 8 3 4 5 9 10
The longest increasing subsequence whose adjacent element differs by one: { 6, 7, 8, 9, 10}
The length of increasing subsequence: 5

Round Exercise (RE)

7.5 Given an array of n positive integers, input through keyboard. Write a program to find the sum of maximum sum subsequence of the given array such that the integers in the subsequence are sorted in increasing order.

Exact Input/output Sample-1

Enter maximum size of array: 7
Enter 10 integers (separated by space): 1 101 2 3 100 4 5

The maximum sum subsequence : {1, 2, 3,100} with sum 106

Exact Input/output Sample-2
Enter maximum size of array: 4
Enter 10 integers (separated by space): 3 4 5 10
The maximum sum subsequence : {3, 4, 5, 10} with sum 22

Exact Input/output Sample-3
Enter maximum size of array: 4
Enter 4 integers (separated by space): 10 5 4 3
The maximum sum subsequence : {10} with sum 10

Exact Input/output Sample-4
Enter maximum size of array: 6
Enter 6 integers (separated by space): 3 2 6 4 5 1
The maximum sum subsequence : {3, 4, 5} with sum 12

7.6 Given an array of n numbers, input through keyboard. Write a program to find out the maximum product formed by multiplying numbers of an increasing subsequence of that array.

Exact Input/Output Sample-1
Enter maximum size of array: 6
Enter 6 integers (separated by space): 3 100 4 5 150 6
The maximum product : 4500
Formed by subsequence: {3, 100, 150}

(Note that the longest increasing subsequence is different {3, 4, 5, 6}

Exact Input/Output Sample-2
Enter maximum size of array: 8
Enter 8 integers (separated by space): 10 22 9 33 21 50 41 60
The maximum product : 4500
Formed by subsequence: {3, 100, 150}

7.7 Given an array of n integers, n is input through keyboard. The problem is to find the length of the subsequence in the given array such that all the elements of the subsequence are sorted in increasing order and also they are alternately odd and even.

Exact Input/output Sample-1
Enter maximum size of array: 6
Enter 6 integers (separated by space): 5 6 9 4 7 8
The longest increasing odd-even subsequence: {5, 6, 7, 8}
The length of odd-even increasing subsequence: 4

Exact Input/output Sample-2
Enter maximum size of array: 10
Enter 6 integers (separated by space): 1 12 2 22 5 30 31 14 17 11
The longest increasing odd-even subsequence: {1, 2, 5, 30, 31} or {1, 2, 5, 14, 17}
The length of odd-even increasing subsequence: 5