



VIT

Vellore Institute of Technology

## Continuous Assessment Test-1 - January 2023

Programme	B. Tech (ECE and Specialization)	Semester	Winter 2022-2023
Course	Design & Analysis of Algorithms	Code	BCSE204L
Faculty	Dominic Savio, Joe Dhanith, Balaji, Manimegalai T	Slot(s)	CI+TC1
		Class Nbr(s)	CH2022235001496, CH2022235001497, CH2022235001498, CH2022235001499
Time	90 Minutes	Max. Marks	50

Answer ALL Questions

1. HLORE is a Greedy algorithm, which retains only odd values in the left child and even values in the right child, while constructing the Huffman tree for generating code. Given a set of letters,  $S_L$  and frequency  $S_F$  of size  $n$  construct the code using HLORE. The design component should contain all the required steps. Analyse the pseudocode with all the required steps. For Example  $S_L = \{I, L, O, V, E, N, D, A\}$  and  $S_F = \{10, 4, 5, 3, 6, 3, 1, 7\}$ , then letters with frequency 10, 4, 6 must come as right child and 5, 3, 3, 1, 7 must come as left child. Check for the correctness with the string "ILOVEINDIA" [10]
2. Max Even Sum of a sub array (MESS) with  $n$  integer numbers, is the maximum sum of all the contiguous elements, which results in an even number. Given a set  $S$  with  $n$  integer numbers, design a greedy pseudocode to compute the subset  $S'$  of  $S$  with maximum summation such that the sum of  $S'$  is even using MESS. For example,  $S = \{-1, 3, -2, 6, -3, 7, -1, 2, 4, -3\}$ , the maximum subarray  $S'$  of  $S$  is  $\{3, -2, 6, -3, 7, -1, 2, 4\}$  as it earns even value 14. The design component should contain all the required steps. Analyse the pseudocode with all the required steps. [10]
3. Given two ' $n$ ' digit numbers  $x, y$ , design a pseudocode based on divide-conquer-combine strategy to compute the multiplication of two integers  $x$  and  $y$ . The pseudocode must execute only the multiplication of two 1-digit numbers while computing  $x * y$ . The design component should contain all the required steps. Analyse the pseudocode with all the required steps for the sample inputs  $x = 3462$  and  $y = 5195$ . [10]
4. Assume that LWKS is an algorithm based on dynamic programming for Largest weight Knapsack, where the item with maximum weight is chosen first regardless of its cost/profit. Let  $W, C$  are the set of values of size  $n$  represents weight and cost respectively. Write a pseudo code for LWKS to find the maximum profit for a knapsack of capacity  $m$ . Test the correctness of your algorithm with the [10]

illustration of the sample values  $n = 4$ ,  $m = 6$ ,  $W = \{1, 2, 4, 5\}$  and  $C = \{3, 5, 7, 8\}$ .

5. Given the sequence  $X = \text{HIAMAVITIAN}$ ,  $Y = \text{AMAZINGKNO}$ , the Longest Common Odd Even Subsequences (LCOES) of  $X$  and  $Y$  is  $\text{AMAIN}$ . As an illustration, the characters of  $\text{AMAIN}$  starts in Odd position and ends in Even position in  $X$  and  $Y$ . So in any LCOES, the sequence of characters occur common with odd position to even position in both  $X$  and  $Y$ . Given two sequences  $\langle X_m, Y_n \rangle$  ( $X_m$  is a sequence of  $m$  characters,  $Y_n$  is a sequence of  $n$  characters), design a dynamic programming based pseudocode to compute the Longest Common Odd Even Subsequence (LCOES) of  $X_m$  and  $Y_n$ . [10]

