VIT®
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

School of Computer Science and Engineering

Winter Semester 2022-2023

Continuous Assessment Test – 1

SLOT: G1 + TG1

Programme Name &Branch : B.Tech

Course Name & code: Design and Analysis of Algorithms & BCSE204L

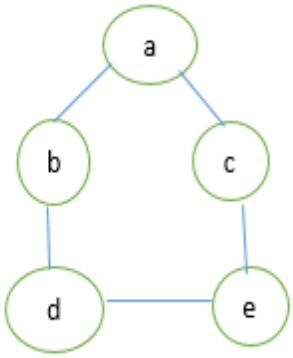
Faulty Name/ID (s): 10622, 11226, 18779, 18842, 17970, 18938, 19594, 16411, 18807, 12497, 17028, 18804, 18998, 18811, 17968, 19615, 11986, 19734, 18973, 19700

Exam Duration: 90 Min. **Maximum Marks: 50**

Q.No.	Question	Max. Marks	CO	BL

1.	a) Write the iterative algorithm to determine the product of first 'n' natural numbers. Prove its correctness using loop invariant method. **(5 Marks)**
	b) Consider the following pseudo code
	`fun( x, n)`
	`{`
	`if ( n==0)`
	`return 1;`
	`if(n==1)`
	`return x;`
	`else`
	`return ( x * fun( x , n – 1 ) ;`
	`}`
	Analyze its functionality and derive its time complexity. **(5 Marks)**
		10	CO1	BL4

2.	a) Write the pseudo code for constructing the Huffman tree using greedy method. **(4 Marks)** b) Consider the string *"abbccddeeef"*. Each letter in the string must be assigned a binary code. Generate the code word for each character by constructing the Huffman tree. i) Find the minimum length of encoded string. ii) Decode the string *"10110011101"*. **(6 Marks)**	10	CO2	BL1 BL3
3.	Consider a chain of 5 matrices and the matrix dimensions as follows: Matrix | A_1 A_2 A_3 A_4 A_5	10	CO2	BL3

	<table><tr><td>Dimensions</td><td>4 x 10 10 x 3 3 x 12 12 x 20 20 x 7</td></tr></table> Apply dynamic programming strategy to find the minimum number of scalar multiplication to compute the product of matrices (A1.A2.A3.A4.A5) with optimal parenthesization.			
4.	The subarray sum S(i,j) is the contiguous subarray with the largest sum. Consider a sequence of 8 elements: A=[-2, 3, 4, -1, -2, 1, 5, -3]. Design O(nlogn) algorithm to find the maximum sum subarray and determine the S(i,j) of given A, where 1<=i<=j<=8.	10	CO2	BL3
5.	Graph coloring is the procedure of assignment of colors to each vertex of a graph such that no adjacent vertices get same color. Design an algorithm for this problem by applying a backtracking method and colour the below graph using red, yellow, and blue (m=3) (show any 10 possible solutions in state space tree). 	10	CO2	BL3