



School of Computer Science and Engineering

Winter Semester 2022-2023

Continuous Assessment Test – I

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												
1.	<p>a) Write the iterative algorithm to determine the product of first 'n' natural numbers. Prove its correctness using loop invariant method. (5 Marks)</p> <p>b) Consider the following pseudo code</p> <pre>fun( x, n) {     if ( n==0)         return 1;     if(n==1)         return x;     else         return ( x * fun( x , n - 1 ) ; }</pre> <p>Analyze its functionality and derive its time complexity. (5 Marks)</p>	10												
2.	<p>a) Write the pseudo code for constructing the Huffman tree using greedy method. (4 Marks)</p> <p>b) Consider the string "abbccddeef". Each letter in the string must be assigned a binary code. Generate the code word for each character by constructing the Huffman tree.</p> <p>i) Find the minimum length of encoded string.</p> <p>ii) Decode the string "10110011101". (6 Marks)</p>	10												
3.	<p>Consider a chain of 5 matrices and the matrix dimensions as follows:</p> <table><tr><td>Matrix</td><td>A<sub>1</sub></td><td>A<sub>2</sub></td><td>A<sub>3</sub></td><td>A<sub>4</sub></td><td>A<sub>5</sub></td></tr><tr><td>Dimensions</td><td>4 x 10</td><td>10 x 3</td><td>3 x 12</td><td>12 x 20</td><td>20 x 7</td></tr></table> <p>Apply dynamic programming strategy to find the minimum number of scalar multiplication to compute the product of matrices (A<sub>1</sub>.A<sub>2</sub>.A<sub>3</sub>.A<sub>4</sub>.A<sub>5</sub>) with optimal parenthesization.</p>	Matrix	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>	A <sub>5</sub>	Dimensions	4 x 10	10 x 3	3 x 12	12 x 20	20 x 7	10
Matrix	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>	A <sub>5</sub>									
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4.	<p>The subarray sum <math>S(i,j)</math> is the contiguous subarray with the largest sum. Consider a sequence of 8 elements: <math>A = [-2, 3, 4, -1, -2, 1, 5, -3]</math>. Design <math>O(n \log n)</math> algorithm to find the maximum sum subarray and determine the <math>S(i,j)</math> of given <math>A</math>, where <math>1 \leq i \leq j \leq 8</math>.</p>	10
5.	<p>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 (<math>m=3</math>) (show any 10 possible solutions in state space tree).</p> <div> <pre> graph TD     a((a)) --- b((b))     a --- c((c))     b --- d((d))     c --- e((e))     d --- e   </pre> </div>	10