



SRM Institute of Science and Technology **Set B**

College of Engineering and Technology

School of Computing

SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamil Nadu

Academic Year: 2022-23 (Even)

Test: CLA-T1

Date: 13-02-2023

Course Code & Title: 18CSC204J Design and Analysis of Algorithms

Duration: 60 mins

Year & Sem: II Year / IV Sem

Max. Marks: 25

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	-	-	-	-	-	-	-	-	-	-
CO2	-	3	2	-	-	-	-	-	-	-	-	-
CO3	-	3	3	-	-	-	-	-	-	-	-	-
CO4	3	2	3	-	-	-	-	-	-	-	-	-
CO5	2	3	-	-	-	-	-	-	-	-	-	-
CO6	-	2	3	-	-	-	-	-	-	-	-	-

Part – A (5x 1 = 5 Marks)

Instructions: Answer all

Q. No	Question	Marks	BL	CO	PO	PI Code
1	_____ criteria denote that, each step in an algorithm must be such that it can, at least in principle, be done by a person using pencil and paper in a finite amount of time. a) Finiteness b) Definiteness c) Effectiveness d) Ambiguous	1	1	1	2	2.1.1
2	The running time of the recursive algorithm can be determined by _____. a) Operation count b) Iterative method c) Recurrence relation d) Tabular method	1	2	1	2	2.3.1
3	If $f(n)=O(g(n))$ then $g(n)=O(h(n))$, then _____. a) $f(n)=\theta(h(n))$ b) $f(n)=\Omega(h(n))$ c) $f(n)=O(h(n))$ d) either b or c	1	1	1	2	2.1.1
4	There are four algorithms A1, A2, A3, A4 to solve the given problem with the order n , n^2 , $n^2 \log n$ and 2^n respectively. Which is the worst algorithm? a) A1 b) A2 c) A3 d) A4	1	2	1	2	2.3.1

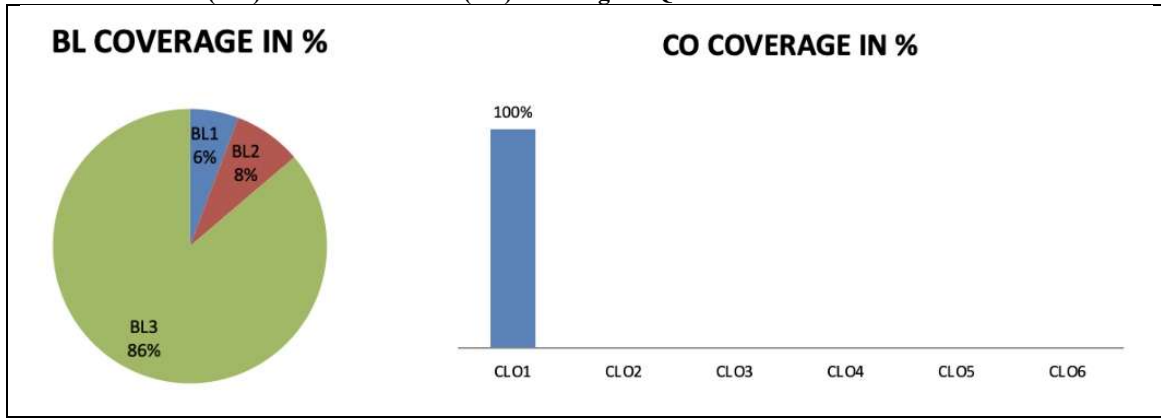
5	Which of the following uses divide and conquer approach? a) Factorial b) Fibonacci c) Merge sort d) Sequential search	1	2	1	2	2.3.1
Part – B (2 x 10 Marks = 20 Marks) Instructions: Answer any 2 Questions						
6	<p>You are playing a game where your task is to arrange the cards in ascending order. You have an option to exchange the one card at a time from your neighbor. The given cards are 6,4,1,2,5. Find the suitable algorithm to arrange cards in order and analyze the time complexities of the given scenario.</p> <p>Ans:</p> <p>Insertion Sort pseudocode (5)</p> <pre> for (i = 1; i < n; i++) { temp = a[i]; j = i - 1; while (j >= 0 && a[j] > temp) { a[j+1] = a[j]; j--; } a[j+1] = temp; } </pre> <p>Sorted: 1, 2, 4, 5, 6 Dry run: (3) Time Complexity Analysis: (2) Best case - $O(n)$ Worst case - $O(n^2)$</p>	10	3	1	2	2.2.3
7	<p>Deduce the time complexity of a given relation using Recursion Tree approach.</p> <p>$T(n) = T(n/3) + T(2n/3) + n; n > 1$ 1 ; $n=1$</p>	10	3	1	2	2.3.2

		<p> $T(n) = T(n/3) + T(2n/3) + n$ $T(n) = T(n/3) + T(2n/3) + n$ $T(n/3) = T(n/9) + T(2n/9) + n/3$ $T(2n/3) = T(2n/9) + T(4n/9) + 2n/3$ $T(n/9) = T(n/27) + T(2n/27) + n/9$ $T(2n/9) = T(2n/27) + T(4n/27) + 2n/9$ $T(4n/9) = T(4n/27) + T(8n/27) + 4n/9$ $T(\frac{2^k}{3^k}n) = T(1) \Rightarrow n = \frac{3^k}{2^k} \Rightarrow k = \log_{3/2} n$ $L_c = 2^k \Rightarrow 2^{\log_{3/2} n} \Rightarrow n^{\log_{3/2} 2}$ $\text{Total cost} = L_c + I_c = n^{\log_{3/2} 2} + n \log_{3/2} n$ </p>					
8	(i)	<p>Given $g(n) = 2n^3 + 3n^2 + 4$ and $f(n) = n^2 \log n$. Show that $f(n) = O(g(n))$ and $g(n) = \Omega(f(n))$.</p> <p>Set B</p> <p>8(i) $g(n) = 2n^3 + 3n^2 + 4$ $f(n) = n^2 \log n$</p> <p>$f(n) = O(g(n))$</p> <p>$n^2 \log n \leq C * 2n^3 + 3n^2 + 4$</p> <p>$n^2 \log n \leq C * (2n^3 + 3n^2 + 4)$</p> <p>$C = 1$ $n \geq n_0 \Rightarrow n_0 = 1$</p> <p>$g(n) = \Omega(f(n))$</p> <p>$2n^3 + 3n^2 + 4 \geq C * n^2 \log n$</p> <p>$C = 1/9$ $n \geq n_0 \Rightarrow n_0 = 1$</p>	5	3	1	2	2.2.2
			5	3	1	2	2.3.2
	(ii)	<p>Examine the following pseudocode and calculate the time complexity using operation count method.</p> <pre> Begin sum=0; for (i=4; i<n; i++) for (j=0; j<=i; j++) sum++; </pre>					

	<div>end for</div> <div>end for</div> <div>end</div>																			
	<table><tr><td>i</td><td>J</td><td>Cost</td></tr><tr><td>4</td><td>0,1,2,3,4</td><td>5</td></tr><tr><td>5</td><td>0,1,2,3,4,5</td><td>6</td></tr><tr><td>6</td><td>0,1,2,3,4,5,6</td><td>7</td></tr><tr><td>7</td><td>0,1,2,3,4,5,6,7</td><td>8</td></tr></table>	i	J	Cost	4	0,1,2,3,4	5	5	0,1,2,3,4,5	6	6	0,1,2,3,4,5,6	7	7	0,1,2,3,4,5,6,7	8				
i	J	Cost																		
4	0,1,2,3,4	5																		
5	0,1,2,3,4,5	6																		
6	0,1,2,3,4,5,6	7																		
7	0,1,2,3,4,5,6,7	8																		
	TC=5+6+7+8...+n=n(n+1)/2=O(n^2)																			

*Program Indicators are available separately for Computer Science and Engineering in AICTE examination reforms policy.

Course Outcome (CO) and Bloom's level (BL) Coverage in Questions



Approved by the Audit Professor/Course Coordinator