

Reg. No.:

Name :



Model Question Paper

Programme	: B.Tech	Semester	:	
Course Title	: Data structures and Algorithms	Code	:	CSE2003
Faculty(s)	:	Class Nbr(s)	:	
Time	: Three Hours	Slot	:	
		Max. Marks	:	100

Answer all the Questions (100)

Q.No.	Sub. Sec.	Question Description	Marks
1.		<p>Given an array X storing n numbers. Compute an array A such that $A[i]$ is the average of elements $X[0], \dots, X[i]$, for $i = 0, \dots, n - 1$ i.e.,</p> $A[i] = \frac{\sum_{j=0}^i X[j]}{i+1}$ <p>Which is known as prefix averages of a sequence of numbers. Design an algorithm to compute prefix averages of a sequence of numbers. Compute the complexity of your algorithm. Can you design an algorithm that has a linear time complexity</p>	10
2.		<p>Design two algorithms(recursive and iterative) that will print the following pattern . Compute the time complexities of your algorithms and identify the most efficient one.</p> <p style="text-align: center;">X X X X X X X X X X ... X X X X X X X (nth Level)</p>	10
3.		<p>Given an array of ' n ' integers, write a recursive function to reverse the order of the elements within the same array without using a new array. Compute the time complexity of your algorithm.</p>	10
4.		<p>Given a connected graph G, design an algorithm that will generate all the spanning trees of G.</p>	10
5.		<p>You have a set of ' n ' integers, each in the range 0 ... K. Partition these integers into two subsets such that you minimize $S1 - S2$, where S1 and S2 denote the sums of the elements in each of the two subsets. Design two different algorithms (two techniques) to solve this problem. Give your comments on both algorithms by analyzing the time complexities of your algorithms.</p>	15
6.		<p>Let $G = (V, E)$ be a given graph. Design a recursive algorithm that will output all the</p>	10

		cycles of the graph originating from a given vertex v . If there exists no cycle with v as its origin, then output "NIL".	
7.		Consider a social network system that, for each user u , stores u 's friends in a list $friends(u)$. The u 's friends list have n number of friends(A,B,C...,N). Friends-Of-Friends(u) is the function defined as , given a user u , recommends the other three different users(X,Y,Z) that are not in u 's friends, but atleast 2 occurrences of friends name among the list of friends of u 's friends. Design an algorithm which recommends the potential friends of 'u' to other three different users X,Y,Z.	15
8.		Let $G = (V, E)$ be a given graph. Assume that the graph is not represented as an adjacency matrix. Now design an algorithm that will output a vertex with maximum degree and a vertex with minimum degree using a divide and conquer approach. The degree of a vertex is defined as the number of edges incident on the vertex.	10
9.		Let $G = (V, E, w)$ be a graph where $w: E \rightarrow \mathbb{R}$ is a function that assigns weights to the edges of the graph G . Let $S \subseteq V$ be a non-empty subset. Design an algorithm to compute a spanning tree of G so that the vertices in the set S are internal vertices in the resulting spanning tree. Analyze the time complexities of your algorithm.	10