

Course Name: Data Structure & Algorithms

Course Outcome:

CO1: Understand the basic concepts of the data structure and algorithms

CO2: Understand the complexity representation in terms of Big Oh, Theta and Omega notations

CO3: Apply the associated operations in linear data structure like stack, Queue and link list

CO4: Apply the associated operations in Binary Search Tree, AVL Tree and M- Way Search Tree

CO5: Understand the basic algorithms such as heap sort, graph traversal, quick sort, AVL trees, and hashing

CO6: Select the appropriate data structure to solve the problem

CO7: Apply the shortest path algorithm to solve real life problem.

Printed Pages: 04

University Roll No.

Mid Term Examination, Even Semester 2021-22

B. Tech. (Hons.) CS, I-Year, II-Semester

Subject Code-BCSC 0006: Subject Name- Data Structure & Algorithms

Time: 2 Hours

Maximum Marks: 15

Instruction for students:

All questions are compulsorily.

Direct answers will not be acceptable. You need to provide proper.

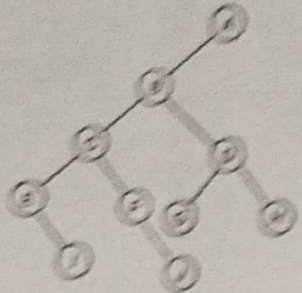
Make appropriate assumptions if you feel information does not compete. However, you need to be provided with proper reasoning behind your beliefs.

Section - A

Attempt All Questions

1 X 3 = 3 Marks

No.	Detail of Question	Marks	CO	BL	KL
1	Consider the usual algorithm for determining whether a sequence of parentheses is balanced. Find the maximum number of parentheses that appear on the stack AT ANY ONE TIME when the algorithm analyses: $((()())())$?	1	CO1	A	C
2	Consider the following C program. struct listnode { int data; struct listnode *next; }; void fun (struct listnode *start) { if (start == NULL start -> next == NULL) return; struct listnode *tmp = start -> next; start -> next = tmp -> next; free (tmp); fun (start -> next); } What is the functionality of the above function?	1	CO3	A	P

3	<p>Print the post order traversal of the given tree below.</p> 	1	CO4	Ao	P
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Section - B

Attempt All Questions

2 X 3 = 6 Marks

No.	Detail of Question	Marks	CO	BL	KL
1	<p>Convert the infix expression $\frac{a}{(e+f)} + b * c$ into postfix by using stack. Show all the steps.</p> <p>OR</p> <p>A schema for storing a binary tree in an array X is as follows. Indexing of X starts at 1 instead of 0. The root is stored at X[1]. For a node stored at X[i] the left child if any is stored at X[2i] and right child at X[2i + 1]. To be able to store any binary tree of n vertices, find the minimum size of array X.</p>	2	CO4	A	P
2	<p>Construct the tree for given preorder and inorder traversal of binary tree.</p> <p>Preorder FAEKCDHGB</p> <p>Inorder EACKFHDBG</p>	2	CO4	E	P
3	<p>The function delete (start, element) is used to delete a node from the linked list by finding the node value with a given element. The parameter start is the first node of the list. Fill the missing statements P and Q in the following "delete" function to delete the node? (Assume all elements are distinct in the list and the function returns pointers that point to the first node of the list).</p> <pre> Node delete (Node start, int element) { Node x = start; if (x->data == element) return start->next; while (x->next != NULL) { </pre>	2	CO3	E	C

<pre> if (P){ Q; return start; } x = x->next; } </pre>				
<p>OR</p> <p>Write the properties of a tree data structure. The height of a tree is the length of the longest root-to-leaf path in it. Find the maximum and minimum number of nodes in a binary tree of height h?</p>				

Section - C

Attempt All Questions

3 X 2 = 6 Marks

No.	Detail of Question	Marks	CO	BL	KL
1	<p>Let Q1 be a queue containing 6 integers and Q2 be an empty queue. Assume that Front(Q) returns the element at the head/front of the queue Q without removing it from Q. Assume that the function delete of Q deletes the front element from Q and function insert of Q inserts the element into Q. Consider the following pseudo code:</p> <pre> while Q1 is not empty do if Front(Q2) <= Front(Q1) OR Q2 is empty then x = Front(Q1) delete(Q1) insert(Q2, x) else x = Front(Q2) delete(Q2) insert(Q1, x) end if end while </pre> <p>What are the number of iterations of the while loop in the given program if Q1 is [5, 3, 1, 6, 4, 2] (Leftmost element is at the top/front of queue). Show all the steps.</p>	3	CO3	E	C

	<p>OR</p> <p>Write the applications of queue data structure. Suppose a circular queue of capacity $(n - 1)$ elements is implemented with an array of n elements. Assume that the insertion and deletion operation are carried out using REAR and FRONT as array index variables, respectively. Initially, $REAR = FRONT = 0$. Explain the conditions to detect queue full and queue empty.</p>				
2	<p>Write C program statements to implement following operations: [1+2]</p> <p>(a) Define a node of a circular linked list which contains a complex number.</p> <p>(b) Assume that the head of the above circular list is pointed by a pointer named head. Write a function which takes the head of the list as argument and returns the sum of complex numbers in the list.</p> <p>OR</p> <p>Explain the advantages and disadvantages of linked over arrays. Write an algorithm to delete alternate nodes in a linked list.</p>	3	CO2	A	F