Question Paper

Exam Date & Time: 20-Jan-2023 (09:30 AM - 12:30 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

THIRD SEMESTER B.TECH. (INFORMATION TECHNOLOGY) EXAMINATIONS - JANUARY/FEBRUARY 2023 SUBJECT : ICT 2153 - DATA STRUCTURES (MAKEUP)

Marks: 50

Duration: 180 mins.

Answer all the questions.

1A)	 Write a user defined function to perform the following: i) Read two polynomials and represent it in the form of doubly linked list. ii) Find the difference between two polynomials iii) Evaluate the resultant polynomial for a given value of x. 	(5)
1B)	Construct a Binary Search Tree and threaded memory representation of the constructed BST for the following data set: 99, 25, 100, 35, 21, 11, 120, 105, 95, 91, 97, 23.	(3)
1C)	Write a recursive function to find sum of all the elements of an array and compute its time complexity.	(2)
2A)	 i) Given a Singly circular linked list containing a set of Data. Obtain the following function from this data structure a) Reverse the direction of the links. b) For given two elements in the list, find the distance (that is the number of nodes) between the two. Write the algorithm and implement it with C++ in each case? ii) A singly linked list is given containing any type of data, obtain the following: a) Reverse the ordering of the data. b) Suppose X and Y are two nodes in the list, add all the data of all the nodes between X and Y (both are inclusive) 1. At the front of the list, so that X is the first node in the list. 2. At the end of the list, so that Y is the last node in the list. 	(5)
2B)	Design and Construct pseudocode for implementing the List of strings, to concatenate the list of strings with substring, displaying the length of the list of string, inserting, and deleting the substring node in front and end of the list of strings of the given linked list using Linear Linked list data structures without using the built-in string functions.	(3)
2C)	Write the user defined function using the application of stack in the Depth First Search (DFS) Algorithm.	(2)
3A)	 In a movie theater there are 'm' queues to issue tickets to customers. Write functions to perform the following operations: i) Add customers to queues so that length of all the queues is approximately same. ii) Issue tickets to customers on queues. The sequence number of the queue from which customer is issued ticket is the user input. 	(5)
3B)	Write a function to traverse a graph using DFS technique. Trace your function to traverse the graph with nodes A, B, C, D, E and F whose adjacency matrix is given below. Consider the source node as A.	(3)

0	1	1	0	0	0
0	0	0	1	0	0
0	0	0	1	1	0
0	0	0	0	1	1
0	0	0	0	0	1
0	0	0	0	0	0

Write a user defined function to check if one binary tree is the mirror image of another tree. (2)

Write a user defined function to perform heap sort in descending order. Trace the same for the max (5) heap shown in Figure Q.4A.



Figure Q.4A

4B)

3C)

4A)

Construct an equivalent binary tree for the tree given in Figure Q.4B. Illustrate the steps of the (3) construction.



Figure Q.4B

Write a function to print all unique elements in an input array.

4C)

(2)

5A) i) Describe the Threaded Binary tree (TBT) and Discuss the TBT types and demonstrate the TBT (5) types using suitable examples, traverse the Morris Traversal (TBT in order traversal) and narrate its advantages and disadvantages and applications of TBT? Point out the difficulties that may arise from the pre-order and post order threaded binary trees in context to traversal, insertion, and deletion operations.
 ii) Write the Presedure to find the minimum and maximum elements from the per empty binary.

ii) Write the Procedure to find the minimum and maximum elements from the non-empty binary search tree.

iii) The algorithm for Max_Heap_insert assumes the single array representation of Heap trees. Write the procedure for the same when heap trees are represented using the linked list data structure.

- 5B) Outline the definition of sparse matrix. Implement the C++ User defined function to implement the (3) Sparse matrix Multiplication and normal transpose of the resultant matrix?
- 5C) Develop User defined function for implementation of the stack and perform Push and Pop (2) operations using the singly linked list?

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