# **Question Paper**

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



## MANIPAL ACADEMY OF HIGHER EDUCATION

#### THIRD SEMESTER B.TECH. DEGREE EXAMINATIONS - NOVEMBER / DECEMBER 2023 SUBJECT: ICT 2121- DATA STRUCTURES

Marks: 50

#### Duration: 180 mins.

#### Answer all the questions.

#### Missing data, if any, may be suitable assumed.

- 1A) Write user-defined functions in C for the following operations to implement a priority queue using (5) circular doubly linked list.
  - i) The enqueue function inserts an element along with its priority at the end.
  - ii) The dequeue function deletes an element with the minimum priority.
  - Show the diagrammatic illustration of the proposed priority queue with an example.
- 1B) Construct a code snippet to display the pre-order traversal of the binary search tree shown in Figure (3) Q.1B using iterative method. Also, provide the end output for the given tree.



### Figure Q.1B

1C) What is the difference between height and depth of a binary tree and height and depth of a node in (2) a binary tree? Illustrate with an example. Write a C program to evaluate a Postfix expression using stack in a iterative manner. 2A) (5)Write a C program to allocate memory of an array using malloc() function and multiply its n 2B) (3)elements with a integer value 2 and print the modified array. Use pointers to access array elements. 2C) Develop a C program to accept ten integer numbers from a user and insert the elements in a stack (2) if they are even. The program should check all the conditions necessary to insert elements in a Stack. Imagine you have a puzzle board with various puzzle pieces scattered across it. However, the (5)3A) puzzle board is quite large, and many of the spaces on the board are empty. This puzzle board can be considered as a sparse matrix. Each puzzle piece has a specific number value. You want to perform the following user-defined functions on this puzzle board represented as a sparse matrix using a singly linked list: i) createSparseMatrix():Create and represent the puzzle board as a sparse matrix using a singly linked list that contains the row, column, and value of each puzzle piece. ii) addElement(head, row, col):add a value to the puzzle board by specifying its row and column. iii) searchElement(head, row, col):Search for a specific value on the puzzle board by providing its row and column.

iv) deleteElement(head, row, col):delete a value from the puzzle board by specifying its row and column.

3B) An array is divided into two stacks: stack0 and stack1. Stack0 starts from index 0 and grows from (3) left to right. Stack1 starts at maxsize-1 and grows from right to left. Write the user defined functions for:

- Inserting an element into i<sup>th</sup> stack
- Deleting an element from i<sup>th</sup> stack
- Display the content of ith stack

3C) Write a user defined function in C to create a copy of binary tree.	(2)
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- 4A) Construct the Binary Search Tree for the given data. P, F, B, H, G, S, R, Y, T, W, Z. Also examine (5) the inorder, preorder and postorder traversal.
- 4B) Build an expression tree for the given Infix expression :  $A/B^*C^*D+E$  and Prefix expression: (3)  $+^{**}/ABCDE$ .
- 4C) Develop a C program to reverse an integer number using recursion.
- 5A) Explain different ways of graph representation using the graph shown in Figure Q.5A. Also, write C (5) function for Depth First Search traversal of a graph.



Figure Q.5A

5B) Write a C code snippet to implement the following functions. Both functions take a pointer to the first (3) node of the singly linked list and the element to be searched as arguments.
i) *SLlist\_count*, which should return a count of the number of times that the given item is found in the list.

ii) *SLlist\_find,* which should return the position of the first occurrence of the given element if it is found and -1 otherwise.

5C) Given two vectors represented by singly linked lists, write a C function that performs addition of (2) these two vectors and returns the pointer to the resultant vector.

-----End-----

(2)