Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

III SEMESTER B.TECH. (COMPUTER SCIENCE & ENGINEERING)
END SEMESTER EXAMINATIONS, NOVEMBER 2018
SUBJECT: DATA STRUCTURES [CSE 2103]
REVISED CREDIT SYSTEM
(24/11/2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:
- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A. Write a program that creates the structure shown in Figure 1A, and reads data into a and b using the pointers x and y. The program then multiplies the value of a by b and stores the result in c using the pointers x, y, and z. Finally, it prints all the three variables using pointers x, y, and z.

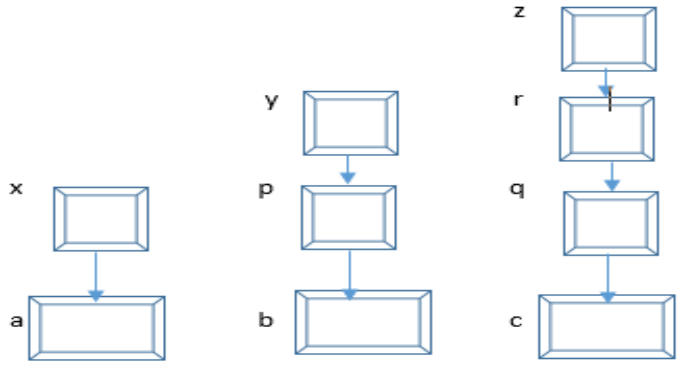

Figure 1A. **(3)**

1B. Write a recursive function to solve Tower of Hanoi problem. Use the prototype given below.

void Tower(int NoOfDisks, char src, char aux, char dest);

Also write call tree for function call ***Tower(3, 'A', 'B' , 'C');*** **(4)**

1C. Briefly explain how the Tagged and Type-defined structures are created and used in C with syntax and an example for each. **(3)**

2A. Write a complete menu driven C program to implement 'n' stacks using a single 1D array containing 'm' locations with following operations,

i) push (int i, int item, STACK * S); //pushing an item on i^{th} stack

ii) pop(int i, STACK *S);//poping an item from i^{th} stack

iii) display(STACK * S); // displaying all n stack contents

For the STACK structure, the members boundary[i] and top[i] represents boundary and top respectively for the i^{th} stack along with element. If a stack is full during push operation and the space is available in 'm' locations of array then shift neighbouring stacks so that space is allocated to the full stack. Incorporate the proper validation checks wherever required. **(5)**

2B. Write an algorithm to convert a prefix expression to postfix expression. Trace the algorithm to convert the prefix expression: **- - / * + *ABCD*EF*GH*** to postfix expression by clearly showing the intermediate steps in the form of table shown below

Current symbol scanned	Action Taken (push/pop etc)	Stack Content

(3)

2C. Define queue? What is the disadvantage of ordinary queue and how to overcome it? **(2)**

3A. Write a complete C program consisting of a function kAltReverse(. . .) to reverse every alternate k nodes in a singly linked list, where k is read from the keyboard. Include functions to insert the nodes in the front of the list and also to display the nodes in the list. **(4)**

3B. Write a complete C program consisting of a function sortedInsert(. . .) to insert an integer into a sorted doubly linked list, such that after insertion the list remains sorted. Also include function to display the contents of the list. **(4)**

3C. Given a pointer to the first node of a doubly linked list. Write a function to display the number of nodes in the list and also free all the nodes of the linked list. **(2)**

4A. Write an iterative function BST_Delete(NODE root, int ele) to delete an element from binary search tree without connecting the left subtree of a node to be deleted to the inorder successor of the node to be deleted. **(5)**

4B. How to convert a binary tree into a threaded binary tree? Write a function to print the inorder sequence of a threaded binary tree. **(3)**

4C. Construct a binary tree for given preorder: **A, B, D, E, H, I, C, F, G** and inorder: **D, B, E, I, H, A, C, G, F** traversals of a tree. **(2)**

5A. Check whether the following trees(shown in Figure 5A (a)(b)(c)) are B-trees are not and also give justification to your answers

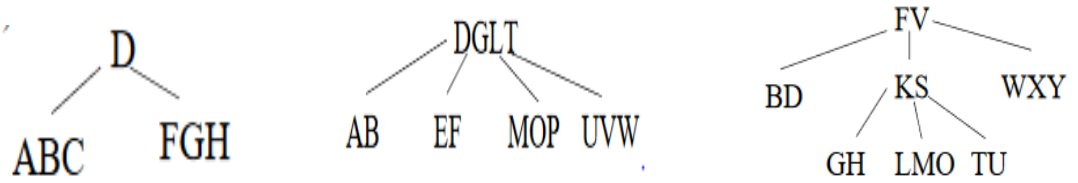

Figure 5A. (a) (b) (c) **(3)**

5B. Write a function to sort a given list of integers using quicksort. **(4)**

5C. List and explain any two methods used to represent the graphs. Using the same methods, represent the graph given below in Figure 5C.

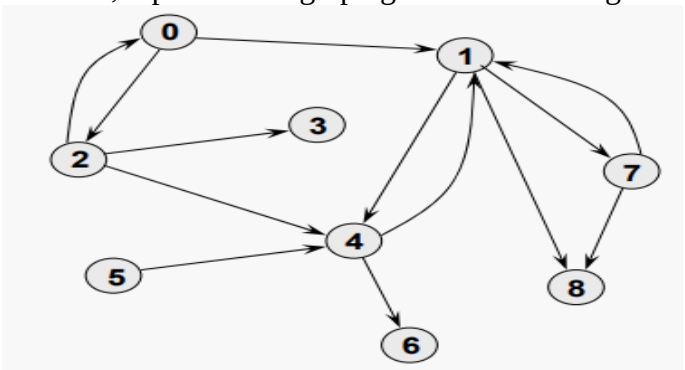

Figure 5C. **(3)**