# FACULTY OF ENGINEERING, UNIVERSITY OF LUCKNOW
## Mid-Term Test - I
### B.Tech, SEMESTER - III, 2022-24
### Branch: CSE/AI/EC

Student's Roll No.............................................................

**Subject Code: CS-301**    **Subject Title: Data Structure Primer Using C**
**Time: 1 Hrs.**    **Full Marks: 20**
**Note:** Attempt questions from each section as per instructions. The symbols have their usual meaning.

## SECTION A

**1. *Attempt all parts of this question. Each part carries 1 mark.***    **(1x5=5)**

a) Define Data Structure.

b) Distinguish between linear data structure and non-linear data structure.

c) Give two advantages of linked list over array.

d) Consider the following operations on a stack: push (9), push (10), push (11), pop, push (15), pop, pop, pop, push (12). State the element present on Stack also determine the index of top of stack.

e) Mention different types of linked list.

## SECTION B

*Attempt any THREE questions of the following. Each question carries 5 marks.*    **(5x3=15)**

2. What is linked list? Explain various operations that can be performed on singly linked list.

3. What is recursion? Write the algorithm/program to find the factorial of given number using recursion.

4. Explain about stack in detail and also mention various operations of stack.

5. Consider an integer array A[5...7][ 8...12] with base address 2000. Calculate the following (size of integer element is 4 byte);

a) Address of A[6][11]

b) Number of elements in array

c) Size occupied in memory

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**B.Tech. IIIrd Semester Examination, 2023**

## DATA STRUCTURE PRIMER USING C

### Paper : CS–301

Time : 3 Hours ]                           [ *M.M.* : **70**

***Note*** :– Answer any *five* questions. All questions carry equal marks.

1. What is a Data Structure ? Why do we need data structures ? How data structures are classified ? Explain in detail.

2. (a) Given the base address of an array A[1300.........1900] [1200................1700] as 1020 and the size of each element is 2 bytes in the memory, find the address of A[1400][1400].

   (b) Explain various operations that can be performed using a linear linked list in detail.

3. What is Stack ? Explain the algorithm of push( ) and pop( ) operations with suitable example. Also convert the following infix expression into postfix expression using stack.

Infix expression :

$$K + L - M*N - (O^\wedge P) * W/U/V * T + Q$$

4. What do you mean by Queue data structure ? Mention various applications of Queue. Also explain the algorithm of enqueue( ) and dequeue( ) operations in detail.

5. (a) What is the inorder, preorder and postorder traversal for the following diagram ?
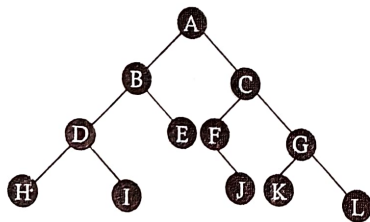


(b) What do you mean by the binary search tree ? Explain various operations that can be performed on BST with suitable example. Also construct a BST for the following sequence of key values :

21, 100, 3, 42, 36, 20, 120, 5, 7, 1, 300

6. What do you mean by AVL tree ? Explain various rotations used in AVL tree with suitable example.

7. Explain the algorithm of Sequential search and Binary search. Also explain hashing and collision resolution techniques with suitable example.
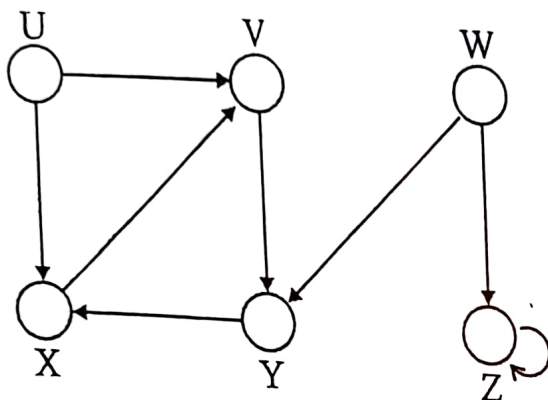
8. Explain the following sorting algorithms :

(i) Bubble sort

(ii) Selection sort

9. What do you mean by Depth First Search and BFS ? Compare the DFS tree for the graph given below :



10. Explain Prims and Kruskal algorithm with suitable diagram and example.