

Roll No. \_\_\_\_\_

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**3E1202**

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**B.Tech. III Sem. (Main&Back) Examination, January/February - 2024**

**Artificial Intelligence & Data Science**

**3AID4-05 Data Structures and Algorithms**

**AID, CAI, CS,IT,CCS, CDS,CIT,CSD, CSR**

**Time : 3 Hours**

**Maximum Marks : 70**

**Instructions to Candidates:**

**Attempt all Ten questions from Part A, Five questions out of Seven questions from Part B and Three questions out of Five questions from Part C.**

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/Calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

**PART - A**

**(Answer should be given up to 25 words only)**

**ALL questions are Compulsory.**

**(10×2=20)**

1. What is Data structure?
2. Explain Asymptotic Notations?
3. What are linear and non-linear data structural .
4. What is linked list? What are its types?
5. Write applications of stacks.
6. Define complete Binary Tree?
7. Differentiate between static and Dynamic memory allocation.
8. What is the concept of minimum spanning Tree?
9. What is meant by abstract data type?
10. Compare tree and graph.

**PART - B**  
(Analytical/Problem solving questions)

(5×4=20)

Attempt any FIVE questions.

1. Explain tower of Hanoi problem in detail and write algorithm for that.
2. Calculate the address of the element  $A[15,25]$  using row major order and column major order for an array  $A[-15.....10, 15.....40]$  of elements. It is stored at location 100 and the size of each element is 4 bytes.
3. Write an algorithm to insert a node at specific location in circular linked list.
4. The in-order and pre-order traversal sequence of nodes in a binary tree are given below:

In-order:      Q, B, K, C, F, A, G, P, E, D, H, R

Pre-order:    G, B, Q, A, C, K, F, P, D, E, R, H

Draw the binary tree.

5. What is Priority Queue? How can it be implemented? Write an applications of priority Queue.
6. Convert the following expression in its equivalent postfix expression.  
 $A+(B \times C - (D/E \wedge F) \times G) \times H$
7. Differentiate single linked list and circular linked list. Also write the advantage and disadvantages of circular linked list.

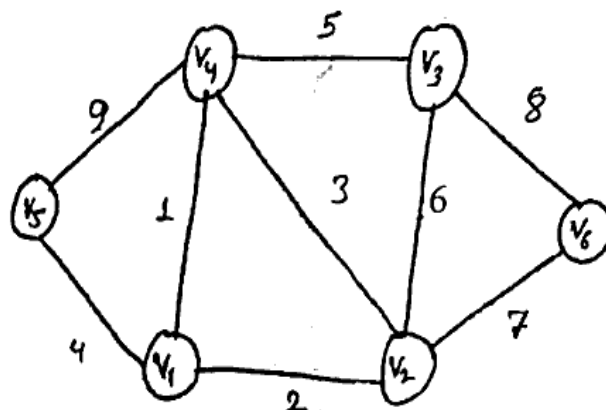
**PART - C**

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any THREE questions.

(3×10=30)

1. Define the spanning tree. Write the Kruskal's algorithm to find the minimum cost spanning tree of the following.



(2)

2. What is an AVL Tree? Explain the concept of Balancing factor. Create an AVL tree using following sequence. 21,26,30,9,4,14,28,18,15,10,2,3,7
3. What is hashing and collision? Discuss the advantages and disadvantages of hashing over other searching techniques.
4. Write an algorithm of Insertion sort. Sort the following elements using Insertion sort: 68,17,26,54,77,93,31,44,55,20
5. Write down the algorithm for following operations of doubly linked list :-
  - a) Insertion of a node in the middle location.
  - b) Delete a node from last location.

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