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**MCA**  
**(SEM II) THEORY EXAMINATION 2023-24**  
**DATA STRUCTURES & ANALYSIS OF ALGORITHMS**

TIME: 3 HRS

M.MARKS: 100

**Note:** 1. Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

1. Attempt all questions in brief.

2 x 10 = 20

| Q no. | Question   | Marks | CO |
|-------|--|-------|----|
| a.    | Define algorithm. Give its characteristics.  | 02    | 1  |
| b.    | What is header linked list?  | 02    | 1  |
| c.    | Define recursion.  | 02    | 2  |
| d.    | What is priority queue?  | 02    | 2  |
| e.    | Traverse a given tree in Pre-order traversal.<br><div style="text-align: center;"> <pre> graph TD     F((F)) --&gt; B((B))     F --&gt; G((G))     B --&gt; A((A))     B --&gt; D((D))     D --&gt; C((C))     D --&gt; E((E))     G --&gt; I((I))     I --&gt; H((H))           </pre> </div> | 02    | 3  |
| f.    | Define Threaded binary tree.   | 02    | 3  |
| g.    | Define fully connected graph.  | 02    | 4  |
| h.    | What is weighted graph?  | 02    | 4  |
| i.    | Apply Quick sort algorithm on the string : D, E, L, H, I   | 02    | 5  |
| j.    | What is minimum spanning tree (MST)?   | 02    | 5  |

**SECTION B**

2. Attempt any three of the following:

3 x 10 = 30

| Q no. | Question   | Marks | CO |
|-------|--|-------|----|
| a.    | How polynomials can be represented using linked list? Write a function/algorithm to add two polynomials.                             | 10    | 1  |
| b.    | What is hashing? How can we define hash function?  | 10    | 2  |
| c.    | Define binary search tree. Create a binary search tree by inserting following keys: 9, 2, 3, 4, 5, 6, 8, 1, 7, 0                     | 10    | 3  |
| d.    | What is the divide and conquer problem solving strategy? How binary search algorithm follows this approach?                          | 10    | 4  |
| e.    | Given two strings, find the Longest Common Subsequence (LCS), present in both of the strings.<br>String-1=ASDFGHJK<br>String-2=SHJLU | 10    | 5  |

**SECTION C**

3. Attempt any one part of the following:

1 x 10 = 10

| Q no. | Question   | Marks | CO |
|-------|--|-------|----|
| a.    | Define linked list. Write a function in C to create a singly linked list.  | 10    | 1  |
| b.    | What is sparse matrix? How it can be represented using header linked list. | 10    | 1  |



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**4. Attempt any one part of the following: 1 x 10 = 10**

| Q no. | Question   | Marks | CO |
|-------|--|-------|----|
| a.    | Give applications of stack. Write an algorithm to evaluate postfix expression. | 10    | 2  |
| b.    | Define linear queue. Write a program or algorithm to implement linear queue.   | 10    | 2  |

**5. Attempt any one part of the following: 1 x 10 = 10**

| Q no. | Question   | Marks | CO |
|-------|--|-------|----|
| a.    | Define AVL tree. Demonstrate LL, RR, LR, RL rotations of AVL tree with suitable examples.                                | 10    | 3  |
| b.    | Write the properties of B-Tree. Insert the following keys in a B-Tree of order 3: 98, 76, 54, 32, 12, 34, 56, 78, 95, 48 | 10    | 3  |

**6. Attempt any one part of the following: 1 x 10 = 10**

| Q no. | Question  | Marks | CO |
|-------|---|-------|----|
| a.    | What is breadth first search (BFS) algorithm for traversing a graph? Apply BFS in the given graph, assuming vertex A as starting vertex. <div style="text-align: center; margin: 10px 0;"> </div> | 10    | 4  |
| b.    | Differentiate between Graph and Tree. Give adjacency matrix representation of the following graph. <div style="text-align: center; margin: 10px 0;"> </div>                                       | 10    | 4  |

**7. Attempt any one part of the following: 1 x 10 = 10**

| Q no. | Question   | Marks | CO |
|-------|--|-------|----|
| a.    | Write a program in C to implement merge sort. Give its time and space complexity.  | 10    | 5  |
| b.    | Find the shortest paths from the source to all the other vertices in the given graph using Dijkstra's algorithm. Assume source vertex as S. <div style="text-align: center; margin: 10px 0;"> </div> | 10    | 5  |