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**MCA**  
**(SEM II) THEORY EXAMINATION 2021-22**  
**DATA STRUCTURES & ANALYSIS OF ALGORITHMS**

**Time: 3 Hours****Total Marks: 100****Note:** Attempt all Sections. If you require any missing data, then choose suitably.**SECTION A****1. Attempt all questions in brief.****2\*10 = 20**

Qno	Questions	CO
(a)	Discuss the limitation of arrays.	1
(b)	Give applications of linked list.	1
(c)	Convert following infix expression into postfix expression: $A + (B * C + D) / E$ .	2
(d)	What are the 3 different ways in which priority queue can be implemented?	2
(e)	Can we apply binary search on unsorted array?	3
(f)	Give an example to demonstrate insertion sort.	3
(g)	Draw the expression tree/2-Tree of following arithmetic expression: $(2 * (4 + (5 + 3)))$ .	4
(h)	What are threaded binary tree?	4
(i)	How the graph can be traversed using Breadth First Search (BFS)?	5
(j)	Discuss Strassen's algorithm for matrix multiplication.	5

**SECTION B****2. Attempt any three of the following:****10\*3 = 30**

Qno	Questions	CO
(a)	What is doubly linked list? Write a function to traverse a doubly linked list in reverse order.	1
(b)	Write a function or algorithm to implement enqueue and deque operations on circular queue.	2
(c)	Use heap sort algorithm to sort the following sequence: {8, 5, 45, 24, 36, 11, 43, 21}. What is the time complexity of the algorithm?	3
(d)	Draw B-Tree of order 3 by inserting following keys in empty tree: {78, 52, 81, 40, 33, 90, 85, 20, 38}.	4
(e)	Discuss Longest Common Subsequence (LCS) problem solution by using dynamic programming. Give example.	5

**SECTION C****3. Attempt any one part of the following:****10\*1 = 10**

Qno	Questions	CO
(a)	Write a function or algorithm to add two Polynomials using linked list.	1
(b)	Define header linked list. Write a function to perform insertion at end in a singly linked list.	1



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

Qno	Questions	CO
(a)	What is Tower of Hanoi problem? Explain the solutions of Tower of Hanoi problem using recursion where number of disks $n=3$ and towers are A, B and C.	2
(b)	What do you understand by hashing? Consider Inserting the keys $\{76, 26, 37, 59, 21, 65, 88\}$ into a Hash table of size $m=11$ . Using linear Probing, consider the primary hash function is $h'(k) = k \bmod m$ .	2

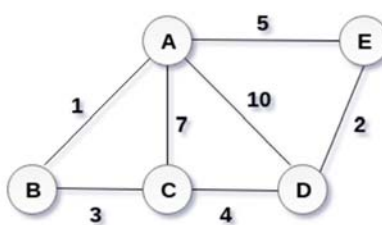
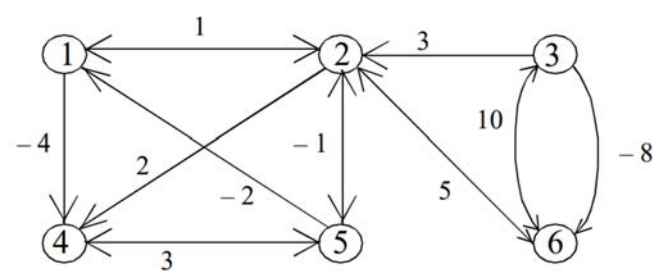
5. Attempt any *one* part of the following: 10\*1 = 10

Qno	Questions	CO
(a)	Perform Quick sort on the following data items stored in single dimensional array: $\{6, 9, 5, 8, 7, 4, 3, 1, 2, 0\}$ . Also discuss its time complexity.	3
(b)	Discuss the function to implement merge sort. What is the time and space complexity of the algorithm?	3

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

Qno	Questions	CO
(a)	How BST is different from sorted array? Discuss the process to find an element in BST?	4
(b)	Insert the following element in empty AVL tree: $\{45, 55, 65, 75, 80, 90, 100, 110, 120, 130, 40, 35, 25, 20, 15, 10, 5\}$ .	4

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

Qno	Questions	CO
(a)	What is minimum spanning tree (MST)? Draw MST of the following graph by applying Kruskal's algorithm. 	5
(b)	For the given graph (weighted, directed) apply Floyd-Warshall algorithm for constructing shortest path. 	5