Roll No: | | | | | | | | | | | | | |

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

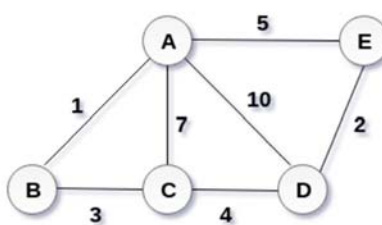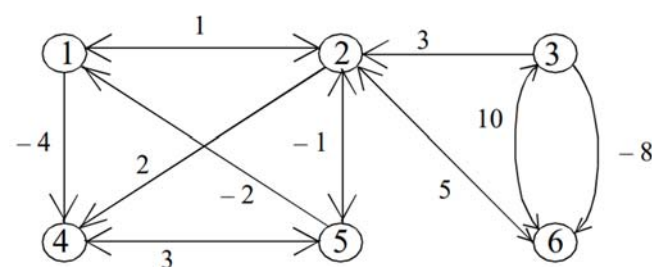| Qno	Questions	CO
(a)	What is Tower of Hanoi problem? Explain the solutions of Tower of Hanoi problem using recursion where number of disks n= 3 and towers are A, B and C.	2
(b)	What do you understand by hashing? Consider Inserting the keys {76, 26, 37, 59, 21, 65, 88} into a Hash table of size m =11.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