PRACTICE SET

End Semester Examination, December2025

Program: MCA **Subject: Advance Data Structure**

Subject Code: 3CIT104 **Semester: I**

Course Outcome:

Students will be able:

1. Learn the basic types for data structure, implementation and application.
2. Know the strength and weakness of different data structures.
3. Use the appropriate data structure in context of solution of given problem.
4. Develop programming skills which require solving given problem.

Section A **(23 x 5=115)**

1. What is a Data Structure? Explain the different operations that can be performed on Data Structures. (CO1,Unit I, Understand, LOT)
2. What is a Doubly Linked List? How does it differ from a Singly Linked List? (CO1,Unit I, Analyze, LOT)
3. Explain the role of algorithms in problem-solving within the field of Computer Science.. (CO1,Unit I, Understand, LOT)
4. Differentiate between Linear and Non-Linear Data Structures. (CO1,Unit I, Analyze, LOT)
5. Define circular linked list? How can we traverse all nodes in a Circular linked list? (CO1,Unit I, Apply, LOT)
6. Explain asymptotic analysis. What is its role in assessing algorithm efficiency? (CO2,Unit I, Understand, LOT)

7. Define a Stack. Explore various applications of stacks in computer science.
   (CO1, Unit II, Understand, LOT)
8. Define a Queue. Write down its applications in computer science?
   (CO1, Unit II, Understand, LOT)
9. Define a Priority Queue. Provide examples to illustrate scenarios where Priority Queues are particularly advantageous.(CO1, Unit II, Understand, LOT)
10. Write postfix, prefix, and expression tree of the following expression.
    (CO3, Unit II, Apply, LOT)
    (a + b) / (c - d) + e / (f *g)
11. Distinguish between stack and queue?(CO2, Unit II, Analyze, LOT)
12. Define an AVL tree and explain its key characteristics.(CO2, Unit III, Understand, LOT)
13. What are the different traversing methods in a binary tree? Explain with a clear example. (CO3, Unit III, Understand, LOT)
14. Consider the following arithmetic expression: (CO3, Unit III, Apply, LOT)
    (10 +y) * ((z / 2) - 5)
    Draw a binary expression tree to represent the expression.
    What expression results from performing a preorder, postorder traversal of the tree that prints the contents of each node in turn, in the order they are visited?
15. Define a B-tree and outline its fundamental characteristics. (CO3, Unit III, Understand, LOT)
16. Define tree data structure with proper diagram. Also name some of the trees.
    (CO3, Unit III, Remember, LOT)
17. What do you mean by sorting, mention some of the sorting technique?
    (CO2, Unit IV, Understand, LOT)
18. Define searching in the context of data structures and algorithms, outlining its fundamental purpose and significance. (CO2,UnitIV,Understand,LOT)
19 What is binary search and why is it more efficient than sequential search on a sorted list structure?(CO2, Unit IV, Understand, LOT)
20 Define the Graph data structure. What are its basic terminologies? (CO3, Unit V, Understand, LOT)
21 Explain the different ways of representing a Graph. (CO3, Unit V, Understand, LOT)
22 Describe the Breadth-First Search (BFS) algorithm used for graph traversal. Explain it with a suitable example. (CO3, Unit V, Understand, LOT)
23 What is a Spanning Tree? Explain how a Minimum Spanning Tree is constructed with an example. (CO3, Unit V, Understand, LOT)

Section B **(18 x 10=180)**

24 Discuss the advantages and limitations of Linked Lists as compared to Arrays. Also, write and explain the algorithms for inserting a node at the beginning and deleting the last node in a Singly Linked List. (CO1, Unit I, Analyze, Apply, LOT)

25 What is an Array? Describe the storage structure of an Array and explain its various types in detail. (CO1, Unit I, Understand ,LOT)

26 Write short notes on the following:

a) Deques

b) Circular Queues (CO3, Unit II, Understand ,LOT)

27 Evaluate the following expression using stack.

a. 7+8*2-10/5 (CO4, Unit II, Apply ,LOT)

28 What is Stack? Why it is known as LIFO? Write algorithm of PUSH, POP, and PEEP operation on Stack. (CO4, Unit II, Apply ,LOT)

29 What is Queue? Why it is known as FIFO? Write an algorithm to insert and delete an element from a simple Queue.(CO4, Unit II, Apply ,LOT)

30 Write down the difference between AVL tree and BST tree. (CO3, Unit III, Analyze ,LOT)

31 What do you mean by Binary Search Tree? What are their characteristics? Explain with proper example. (CO3, Unit III, Understand ,LOT)

32 What is Binary Tree? Explain Representation of Binary tree. Also calculate total number of nodes present in a Binary tree of height ‘h’.(CO3, Unit III, Understand ,LOT)

33 Create a Binary Search Tree for the following data and do in-order, Preorder and Post-order traversal of the tree. 50, 60, 25, 40, 30, 70, 35, 10, 55, 65, 5 .(CO3, Unit III, Create ,LOT)

34 Explain the Bubble Sort algorithm in detail, providing a step-by-step breakdown of the sorting process. Discuss the time complexity of Bubble Sort.(CO2, Unit IV, Apply ,LOT)

35 Explain the Selection Sort algorithm in detail, providing a step-by-step breakdown of the sorting process. Discuss the time complexity of Selection Sort. .(CO2, Unit IV, Apply ,LOT)

36 Write a comprehensive C program to implement the Bubble Sort algorithm. Ensure your program includes necessary comments and follows best coding practices. Demonstrate the functionality of your program by sorting an array of integers. Discuss the time complexity of the Bubble Sort algorithm. (CO2, Unit IV, Apply ,LOT)

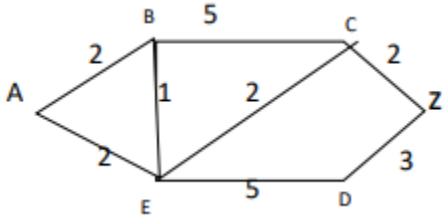
37 Write a comprehensive C program to implement the Selection Sort algorithm. Ensure your program includes necessary comments and follows best coding practices. Demonstrate the functionality of your program by sorting an array of integers. Discuss the time complexity of the Selection Sort algorithm. (CO2,Unit IV, Apply ,LOT)

38 What is Heap sort? Explain it with the following given list of data and also discuss its time complexity.

98, 35, 13, 89, 75, 22, 90, 53. (CO2, Unit IV, Apply, LOT)

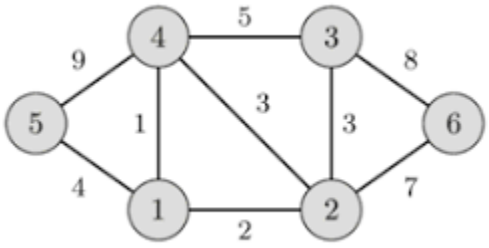
39 Explain directed, undirected and weighted graph? (CO3, Unit V, Understand ,LOT)

40 Using Kruskal's Algorithm find the minimum spanning tree for the following graph. (CO3,Unit V, Apply ,LOT)



b.

41 Find the Minimum Spanning Tree (MST) of the given graph by applying Prim's Algorithm (CO3, Unit V, Apply, LOT)



Section C **(9x 20=180)**

42 Design an efficient algorithm to insert nodes at both the beginning and end of a Doubly Linked List. Clearly outline the steps, handle all edge cases, analyze its time complexity, and validate the algorithm with a suitable example (CO1, Unit I, Create, HOT)

43 Design an efficient algorithm to create and display a Singly Linked List. Explain each step, analyze its time complexity, and validate the algorithm with an example.
(CO1, Unit I, Create, HOT)

44 Define the concept of a Stack and develop efficient algorithms for PUSH and POP operations. Implement these operations using an array, and evaluate their time and space complexity with proper justification. (CO4, Unit II, Create, HOT)

45 Define a Queue and develop optimized algorithms for ENQUEUE and DEQUEUE operations. Implement these operations using an array, and critically analyze their time and space complexity with proper justification.(CO4, Unit II, Create, HOT)

46 Describe B tree? Obtain a B tree of order 3 and 4 by inserting one key at a time in the following sequence? 81, 149, 105, 60,153, 129, 17, 19, 131, 143, 127 Show all the steps. (CO3 , Unit III, Create, HOT)

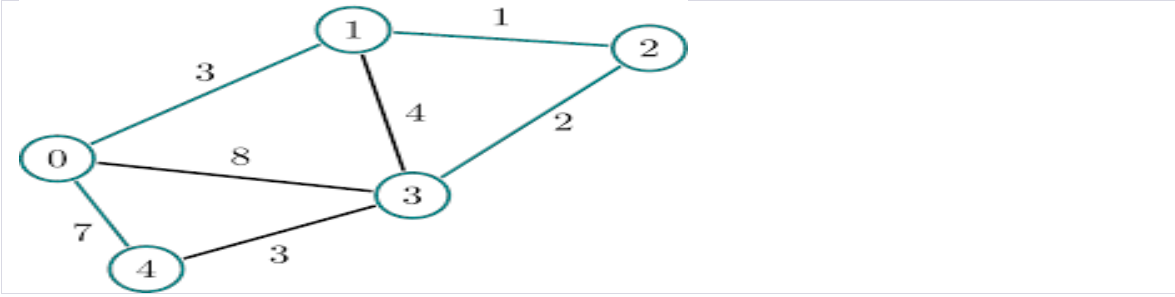
47 Define an AVL tree. What is its characteristic .Obtain an AVL tree by inserting one key at a time in the following sequence? 87, 156, 163, 115, 119, 177, 188, 158, 143 Show all the steps. (CO3 , Unit III, Create, HOT)

48 Define Merge Sort and highlight its significance in sorting algorithms. Write down its algorithm and implement it in C program, also mention its time complexity. (CO4,Unit IV, Apply, HOT)

49 Define Quick Sort and explain its importance in sorting. Write its algorithm, describe the partitioning process step by step with an example, and analyze its time complexity..

78, 45, 23, 89, 65, 12, 90, 33 (CO4, Unit IV, Create, HOT)

50 Provide a concise introduction to Dijkstra's algorithm, explaining its primary objective in finding the shortest path in a weighted graph. Describe the **step-by-step process** of Dijkstra's algorithm, and using the given graph, find the shortest path from the source vertex to all other vertices. Finally, mention **the** time complexity of Dijkstra's algorithm.. (CO4,Unit V, Apply, HOT)



Summary Sheet:

CO Wise

CO	Q. No	Marks
CO1	1-9,24,25,42,43	105
CO2	10-12,17-19,34-38,48,49	110
CO3	13-16,20-23,26,30-33,39-41,46,47	130
CO4	27-29,44,45,48-50	130
Total		**475**

Unit Wise

Unit	Q. No	Marks
Unit 1	1-6,24,25,42,43	90
Unit 2	7-11,26-29,44,45	105
Unit 3	12-16,30-33,46,47	105
Unit 4	17-19,34-38,48-49	105
Unit 5	20-23,39-41,50	70
Total		**475**

Blooms Taxonomy Level (BTL) Wise

BTL	Q. No	Marks
LOT	1-41	295
HOT	42-50	180
Total		**475**

Prepared by: Dr. Md. Irfan Alam

Disclaimer: - This is a Practice Set. The Question in End term examination will differ from the Practice set. This Practice set is meant for practice only.