Total No. of Questions: 20

Enrollment No : _____

MEDICAPS UNIVERSITY

Faculty of Engineering

End Semester Examination May 2025

EC3CO28 Data Structures

Programme	:	B.Tech.	**Branch/Specialisation**	:	EC
Duration	:	3 hours	**Maximum Marks**	:	60

Note: *All questions are compulsory. Internal choices, if any, are indicated. Assume suitable data if necessary. Notations and symbols have their usual meaning.*

Section 1 (Answer all question(s))

		Marks	CO	BL
Q1.	Which of the following is an example of a linear data structure?	1	1	1
	○ Tree ◉ Stack ○ Graph ○ Binary tree			
Q2.	What type of linked list allows traversal in both directions?	1	1	1
	○ Singly linked list ○ Circular linked list ◉ Doubly linked list ○ Tree			
Q3.	What is a non-linear data structure?	1	2	1
	○ Data elements are arranged in a sequential manner ○ Data elements are arranged in a hierarchical manner ◉ Data elements are not arranged in a sequence ○ Array			
Q4.	What is the maximum number of nodes at level k in a binary tree?	1	2	2
	○ k ◉ 2^(k-1) ○ 2k ○ None of these			
Q5.	With what data structure can a priority queue be implemented?	1	3	1
	◉ Heap ○ List ○ Array ○ Tree			
Q6.	What is the time complexity to insert a node based on key in a priority queue?	1	3	1
	○ O(n log n) ◉ O(log n) ○ O(n) ○ O(n2)			
Q7.	Which of the following sorting algorithm does not use recursion?	1	4	2
	◉ Bottom up merge sort ○ Merge sort ○ Heap sort ○ Quick sort			
Q8.	Which of the following sorting algorithms is the fastest for sorting small arrays?	1	4	2
	○ Quick sort ○ Shell sort ○ Heap sort ◉ Insertion sort			
Q9.	Which of the following is a disadvantage of linear search?	1	5	2
	○ Requires more space ◉ Greater time complexities compared to other searching algorithms ○ Not easy to understand ○ Not easy to implement			

Q10. What is a hash table? **1 5 2**

- ○ A structure that maps values to keys
- ◉ A structure that maps keys to values
- ○ A structure used for storage
- ○ A structure used to implement stack and queue

Section 2 (Answer all question(s))

Marks CO BL

Q11. What is an abstract data type? Explain its operation. **3 1 2**

Rubric	Marks
1.5 mark each	3

Q12. (a) What is Linked List? Explain linked list-based Implementations of stack and queue with suitable example. Explain any three applications of linked lists, arrays, and queues in the computer field. **7 1 2**

Rubric	Marks
What is Linked List-1, Explain Linked List-based Implementations of Stack and Queue with suitable example-3 Explain any three Applications of Linked Lists, Arrays, and Queues in the Computer Field-3	7

(OR)

(b) Define arrays. How arrays are represented? Explain it in detail with suitable examples.

Rubric	Marks
Define Arrays-2 How arrays are Represented.-3 Explain in detail with suitable examples-2	7

Section 3 (Answer all question(s))

Marks CO BL

Q13. Explain the following : **3 2 2**

- Tree in the context of data structures
- The root of a tree in a non-linear data structure
- The main properties of a binary tree

Rubric	Marks
a. Tree in the context of data structures?-1 b. The root of a tree in a non-linear data structure?-1 c. The main properties of a binary tree?	3

Q14. (a) Explain the concept of graphs as a non-linear data structure. What are the different types of graphs? How do you represent them? Discuss the applications of graphs in real-world scenarios. **7 2 2**

Rubric	Marks
Explain the concept of graphs as a non-linear data structure.-2 What are the different types of graphs, and how do you represent them? -3MARKS Discuss the applications of graphs in real-world scenarios.	7

(OR)

(b) Write the application of trees. Explain set representation and union. How 'Find' operations are performed?

Rubric	Marks
Write the Application of Trees.-2 How Find operations are performed.-2 Explain Set representation and Union.-3	7

Section 4 (Answer all question(s))

Marks CO BL

Q15. Define AVL tree? What is the maximum height of any AVL-tree with 7 nodes? (Assume that the height of a tree with a single node is 0) **3 3 2**

Rubric	Marks
Define AVL tree?-1 What is the maximum height of any AVL-tree with 7 nodes? -2	3

Q16. (a) Write and explain Red-Black Tree algorithm with suitable example. Also write the properties of Red-Black Tree. **7 3 2**

Rubric	Marks
Algorithm -2 Example-2 Properties of Red-Black Tree -3	7

(OR)

(b) With suitable example explain Leftist trees and skew heap data structures. Also compare them.

Rubric	Marks
Leftist trees and skew heap -5 Compare -2	7

Section 5 (Answer all question(s))

Marks CO BL

Q17. Write any three applications of sorting in computer field. **3 4 2**

Rubric	Marks
one mark each	3

Q18. (a) What is sorting? Explain in detail k-way merging algorithm with an example. **7 4 2**

Rubric	Marks
sorting-2 k-way merging algorithm-5	7

(OR)

(b) Write a short note on insertion sort, merge sort, quick sort and heap sort.

Rubric	Marks
insertion sort, Merge sort, Quick sort 2 marks each-6 Heap sort.-1	7

Section 6 (Answer all question(s))

Marks CO BL

Q19. Define searching and indexing. **3 5 2**

Rubric	Marks
1.5 marks each	3

Q20. (a) Explain linear search and binary search. Write any three applications of searching in computer field. **7 5 2**

Rubric	Marks
Linear Search and Binary Search-4 Applications-3	7

(OR)

(b) Explain hash index and B-tree indexing. Write down applications of Indexing in computer field.

Rubric	Marks
Hash Index and B-Tree Indexing 2 marks each-4 Applications-3	7

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