

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Bachelor of Technology (Computer Science and Design) SEMESTER - 3 Summer 2025 (Supply.)

Course :Bachelor of Technology (Computer Science and Design) Branch : Engineering and Technology

Semester : SEMESTER - 3

Subject Code & Name: BTCOC303 - DATA STRUCTURES

Time : 3 Hours]

[Total Marks : 60

Instructions to the Students:

1. Each question carries 12 marks.
2. Question No. 1 will be compulsory and include objective-type questions.
3. Candidates are required to attempt any four questions from Question No. 2 to Question No.6
4. Use of non-programmable scientific calculators is allowed.
5. Assume suitable data wherever necessary and mention it clearly.

Q1. Objective type questions. (Compulsory Question)

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1. What does ADT stand for?
A) Abstract Data Tree
B) Abstract Data Type
C) Algorithm Design Technique
D) Algorithm Data Table
2. Which data structure uses hash functions?
A) Array
B) Stack
C) Hash Table
D) Queue
3. What is the key characteristic of sparse matrices?
A) All elements are non-zero
B) Majority of elements are zero
C) Rows are fixed in size
D) They are immutable
4. Which hashing technique avoids collisions by using multiple hash functions?
A) Open Addressing
B) Perfect Hashing
C) Separate Chaining
D) Linear Probing
5. Which of the following is not an application of stacks?
A) Expression evaluation
B) Expression conversion
C) Recursion
D) Binary Search
6. What is the unique feature of a circular queue?
A) Elements are linked to their memory address
B) The last position connects to the first position
C) It has dynamic resizing
D) It allows duplicate entries
7. In a priority queue, the priority of elements determines the:
A) Data type
B) Order of insertion
C) Order of deletion
D) Memory allocation

- 8 Which type of linked list allows traversal in both directions?
 A) Singly Linked List
 B) Doubly Linked List
 C) Circular Linked List
 D) Skip List
- 9 What operation involves freeing unused memory in dynamic memory management?
 A) Traversal
 B) Concatenation
 C) Garbage Collection
 D) Deletion
- 10 Which type of tree has at most two children per node?
 A) Binary Tree
 B) Threaded Tree
 C) Balanced Tree
 D) Heap
- 11 Warshall's algorithm is used for:
 A) Sorting
 B) Shortest path in a graph
 C) Finding connected components
 D) Transitive closure of a graph
- 12 Which sorting algorithm uses a non-comparison technique?
 A) Insertion Sort
 B) Selection Sort
 C) Radix Sort
 D) Merge Sort
- Q2. Solve the following.
- A) Write an algorithm to search an element using binary search. Discuss its time complexity. 6
- B) Write a C/C++ program for selection sort. 6
- Q3. Solve the following.
- A) Convert $P*(Q+R)/S$ to postfix notation. Write algorithm and step-by-step conversion using the stack. 6
- B) What is post fix notation? Explain with examples. Write the algorithm for converting from infix to postfix. 6
- Q4. Solve Any Two of the following.
- A) Distinguish between stack and queue. 6
- B) Given the following inorder and preorder traversal reconstruct a binary tree
 Inorder – D,G,B,E,A,F,I,C
 Preorder – A,B,D,E,H,C,F,I 6
- C) Sort the following list using heap sort.
 66,33,40,20,50,88,60,11,77,30,45,65 6
- Q5. Solve Any Two of the following.
- A) Write a complete program in C to create a singly linked list. 6
- B) What do you mean by complexity of an algorithm? Explain the meaning of worst-case analysis and best-case analysis with an example. 6
- C) What is a binary tree? What is the maximum number of nodes possible in a binary tree of depth. 6
- Q6. Solve Any Two of the following.

- A) Describe insertion sort with a proper algorithm. What is the complexity of insertion sort in the worst case? 6
- B) Explain the concept of hashing division method of hashing. Store the following values in a hash table of size 11, 25, 45, 96, 101, 102, 162, 197, 201. 6
- C) What is meant by circular queue and priority queue. write a function to insert and delete an element from a circular queue. 6

*** End ***