

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Supplementary Winter Examination – 2025

Course: B.Tech in Computer Engineering and Allied Branches

Semester: III

Subject Code & Name: Data Structures (BTCOC303)

Max Marks: 60

Date: 31st January 2026

Duration: 3 Hr.

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 The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question.
- 5 Use of non-programmable scientific calculators is allowed.
- 6 Assume suitable data wherever necessary and mention it clearly.

Marks

Q. 1 Objective type questions. (Compulsory Question)

12

- 1 Binary search requires the list to be _____. 1
a) Sorted b) Unsorted c) Random d) Reversed
- 2 Which data structure is best suited for CPU scheduling? 1
a) Stack b) Array c) Linked List d) Queue
- 3 Which collision resolution technique uses linked lists? 1
a) Linear probing b) Quadratic probing c) Double hashing d) Chaining
- 4 Which data structure follows LIFO principle? 1
a) Stack b) Queue c) Deque d) Priority Queue
- 5 A complete binary tree is efficiently represented using a _____. 1
a) linked list b) array c) stack d) queue
- 6 Insertion and deletion in a linked list do not require _____ shifting. 1
a) pointer b) memory c) element d) index
- 7 Match the pair: 1
A. Linear DS 1. Stack
B. Non-linear DS 2. Binary Tree
C. Hashing 3. Open Addressing
D. Sparse Matrix 4. Memory-efficient array
a) A-2, B-1, C-4, D-3 b) A-1, B-2, C-3, D-4
c) A-3, B-4, C-1, D-2 d) A-4, B-3, C-2, D-1
- 8 In worst case Quick Sort has order 1
a) $O(n \log n)$ b) $O(n^2/2)$ c) $O(\log n)$ d) $O(n^2/4)$
- 9 The smallest element of an arrays index is called its 1
a) Lower bound b) Upper bound c) Range d) Extraction

- 10 In-order traversal of a BST gives nodes in _____ order. 1
 a) random b) descending c) ascending d) level
- 11 Insertion of a node at the beginning of a singly linked list requires updating the _____ 1
 pointer.
 a) tail b) previous c) head d) null
- 12 Binary search has a time complexity of _____ in the worst case. 1
 a) $O(n)$ b) $O(\log n)$ c) $O(n \log n)$ d) $O(1)$

Q. 2 Solve the following. 12

- A)** i. Which is the appropriate Data Structure for “Program A calls subprogram B.” 6
 ii. Define the terms: a) Data Structures b) Sparse Matrix c) Hash Function
 iii. Represent the following sparse matrix using 3-tuple form:
- | | | | |
|---|---|---|---|
| 0 | 0 | 3 | 0 |
| 4 | 0 | 0 | 0 |
| 0 | 0 | 5 | 7 |
| 0 | 0 | 0 | 0 |
- B)** Compare and contrast linear and non-linear data structures with examples and suitable diagram. 6

Q.3 Solve the following. 12

- A)** Define stack and write an algorithm to perform the PUSH operation on Stack. Given a sequence of stack operations, analyze the final stack contents: PUSH 5, PUSH 10, POP, PUSH 20, PUSH 30, POP. 6
- B)** Show each steps to convert given infix expression into Postfix expression: 6
 $A + (B * C - (D / E \uparrow F) * G) * H$

Q. 4 Solve Any Two of the following. 12

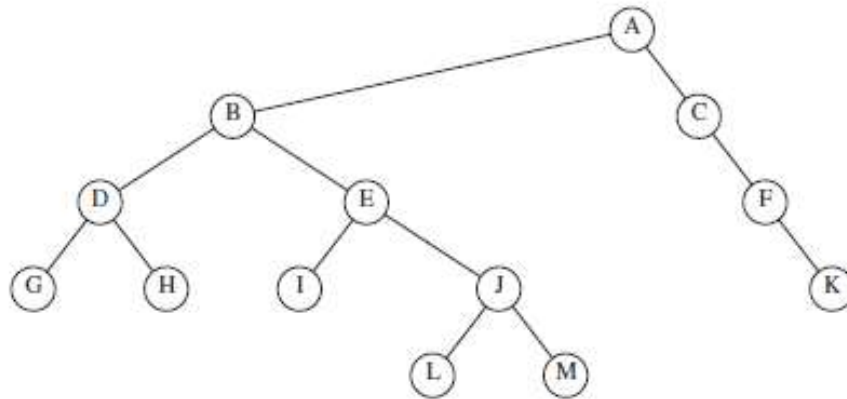
- A)** Differentiate between singly, doubly, and circular linked lists. 6
- B)** Write an algorithm to insert a new node at the end and delete a node from end of a singly linked list. 6
- C)** Write a syntax for node in singly linked list? Insert the following elements in sequence in an empty linked list from begin A, from end D, from end U, from begin X, from end C, from begin Y. 6

Q.5 Solve Any Two of the following. 12

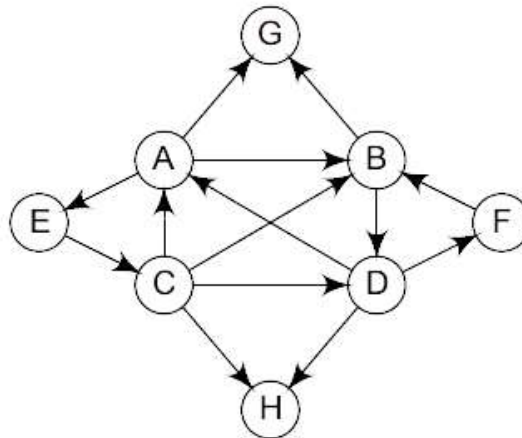
- A)** Create a binary search tree using the following data elements: 45, 39, 56, 12, 34, 78, 32, 10, 89, 54, 67, 81. Also give, Inorder, Preorder, and Postorder Traversal of generated 6

BST.

- B)** Define Binary Tree. What are the two ways of representing binary trees in the memory? 6
Give the array representation of the binary tree given in the below figure.



- C)** What is a graph? Explain its key terms. Consider the graph given below. 6
(a) Write the adjacency matrix of G. (b) Write the path matrix of G.



Q. 6 Solve Any Two of the following. 12

- A)** Apply Insertion sort to the array: 25, 15, 10, 40, 30, 45, 54, 95, 62, 45 and show all passes. 6
B) Define linear and binary search. Write an algorithm for binary search. 6
C) Given an array: A = [12, 5, 8, 4, 19], apply selection sort and show each step. 6

*** End ***