

Total No. of Questions : 20

Total No. of Pages : 02

Roll No. 202101010000

Paper Code
2C8123

MCA II Sem(Main/Back) Exam 2026
MCA-203 Data Structures
2C8123

Time: 3 Hours

Maximum Marks: 70

Attempt all Ten questions from Part A. All Five questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data missing may suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination(As mentioned in form No.205)

1. _____

2. _____

Part A (Word limit 25)

- Q.1 What is Data Structure? Also write the names of the operations performed on it.
- Q.2 Differentiate between linear and non-linear data structures.
- ~~Q.3~~ The result evaluating the postfix expression $10\ 5\ +\ 60\ 6\ /\ * 8$ - is
- Q.4 Write the name of the most efficient search technique used in an ordered array.
- Q.5 What is Stack? Also write any two applications in the field of computer science
- ~~Q.6~~ Consider a linked list of n elements. The time taken to insert an element after an element pointed by some pointer is
- ~~Q.7~~ The data structure used in traversing a given graph by breadth first search is
- Q.8 What is a header list?
- Q.9 What is the time complexity of sequential search?
- ~~Q.10~~ "Insertion sort gives the best performance, if the input array is sorted or nearly sorted." Yes or No. Justify your answer.

10 x 2 = 20

Part B (Word limit 100)

- Q.1 Covert the given expression into its equivalent postfix expression using stack. Show the contents of stack for each step. $(A+B) * D + E / (F + A * D * E) + C$
- Q.2 Analyse the best-case and worst-case time complexity of bubble sort using appropriate examples. Also, analyse the space complexity of bubble sort.
- Q.3 Write an efficient algorithm for detecting a loop in a linked list. Also state its time and space complexity

- Q.4. What is a Binary Search Tree (BST)? Make a BST for the following sequence of numbers. 55, 36, 70, 23, 89, 100, 58, 39, 41, 60, 65, 25 Write Preorder, In-order and postorder traversal of this tree.
- Q.5 Construct the binary tree, with respect to the following traversals of the tree.
- INORDER : H K D B I L E A F C M J G
- PREORDER: A B D H K E I L C F G J M

5 x 4 = 20

Part C (Any three)

- Q.1 What is a Binary Tree? What is the maximum number of nodes possible in a Binary Tree of depth d. Explain the following terms with respect to Binary tree:
- i) Strictly Binary Tree
 - ii) Complete Binary Tree
- Q.2 A queue is represented in memory using a circular array of size n. Write conditions to check underflow and overflow for this circular array <https://www.rtuonline.com>
- Q.3 What is an AVL tree? Who invented it? Construct an AVL tree by inserting the sequence [30, 20, 40, 10, 25, 35, 50, 5] and show the balancing process. Also, explain the different types of rotations performed during insertion or deletion of an element.
- Q.4 a) Explain merge sort with an example array and show merging steps.
- b) Evaluate quick sort vs. merge sort for large datasets. 7+3=10
- Q.5 a) Write an algorithm to merge two sorted arrays into a third array. Do not sort the third array.
- b) What is an algorithm? What are the characteristics of a good algorithm? 6+4=10

3 x 10 = 30