Printed Page:- 04 **Subject Code**:- **AMCA0203N**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

MCA

SEM:II CARRY OVER THEORY EXAMINATION-AUGUST 2023

Subject: Data Structure and Analysis of Algorithm

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* **three Sections -A, B, & C.** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION A **20**

1. Attempt all parts:-

1-a. Which of these best describes an array? (CO1) 1

(a) A data structure that shows a hierarchical behavior

(b) Container of objects of similar types

(c) Arrays are immutable once initialised

(d) Array is not a data structure

1-b. What would be the asymptotic time complexity to add a node at the end of singly linked list, if the pointer is initially pointing to the head of the list? (CO1) 1

(a) O(1)

(b) O(n)

(c) θ(n)

(d) θ(1)

1-c. Which of the following is not the application of stack? (CO2) 1

(a) A parentheses balancing program

(b) Tracking of local variables at run time

(c) Compiler Syntax Analyzer

(d) Data Transfer between two asynchronous process

1-d. Which data structure can be used to test a palindrome? (C02) 1

(a) Tree

(b) Heap

(c) Stack

(d) Priority queue

1-e. Find number of passes to sort the elements using insertion sort ans array A =< 14, 12,16, 6, 3, 10> (C03) 1

(a) 6

(b) 5

(c) 4

(d) 3

1-f. What is an internal sorting algorithm? (CO3) 1

(a) Algorithm that uses main memory during the sort

(b) Algorithm that involves swapping

(c) Algorithm that are considered 'in place'

(d) Algorithm that uses tape or disk during the sort

1-g. In preorder traversal of a binary tree the second step is _____ (CO4) 1

(a) Traverse the right subtree

(b) Traverse the left subtree

(c) Traverse right subtree and visit the root

(d) Visit the root

1-h. In preorder traversal of a binary tree the Third step is _____ (C04) 1

(a) Visit the root

(b) Traverse right subtree and visit the root

(c) Traverse the left subtree

(d) Traverse the right subtree

1-i. Bellman Ford does not work for (C05) 1

(a) That contain positive weight edge

(b) That contain negative weight edge

(c) That contain Positive weight cycle

(d) That contain negative weight cycle

1-j. Floyd Warshall Algorithm is used for (C05) 1

(a) Spanning Tree

(b) None of these

(c) Single Source Shortest Path problem

(d) Multi Source Shortest Path problem

2. Attempt all parts:-

2.a. Define Space Complexity. (C01) 2

2.b. Define Sequential Search with an example. (CO2) 2

2.c. Differentiate between internal and external sorting. (CO3) 2

2.d. Suppose you are given a binary tree with n nodes, such that each node has exactly either zero or two children.What will be the maximum height of the tree ? (CO4) 2

2.e. List steps involved in Divide and Conquer. (CO5) 2

SECTION B **30**

3. Answer any <u>five</u> of the following:-

3-a. Write an algorithm to find the length of a linked list. (C01) 6

3-b. How polynomial manipulations are performed with linked lists? Explain the operations (CO1) 6

3-c. List down the basic operations on Queue. Differentiate between Enqueue and Dequeue. (CO2) 6

3-d. Write down the algorithm for push operation in stack. Explain with help of example. (CO2) 6

3.e. Illustrate the operation of insertion sort on the array <6, 3, 5, 7, 2, 4) (CO3) 6

3.f. Write C function or algorithm to implement BST for searching an element. (CO4) 6

3.g. Write a C program to sort a list of elements using the merge sort algorithm. (CO5) 6

SECTION C **50**

4. Answer any <u>one</u> of the following:-

4-a. Write a program in C to delete a node from the middle of a circular linked list. (CO1) 10

4-b. What are the applications of linked list in dynamic storage management? (CO1) 10

5. Answer any <u>one</u> of the following:-

5-a.	Write the algorithm for converting infix expression to postfix (polish) expression?(CO2)	10
5-b.	What is a DeQueue? Explain its operation with example? (CO2)	10

6. Answer any <u>one</u> of the following:-

6-a.	Explain different types of Graphs in detail with help of example. (CO3)	10
6-b.	What is Graph? Explain matrix and linked list representation of a graph. Also give the application of Graph. (CO3)	10

7. Answer any <u>one</u> of the following:-

7-a.	Create a binary search tree for the following numbers start from an empty binary search tree. 45,26,10,60,70,30,40 Delete keys 10,60 and 45 one after the other and show the trees at each stage. (CO4)	10
7-b.	Explain Inorder, Preorder and Postorder Traversal operation on Binary tree with example. (CO4)	10

8. Answer any <u>one</u> of the following:-

8-a.	What is the output of quick sort for the following sequence? 24 56 47 35 10 90 82 31 (CO5)	10
8-b.	Write and explain Dijkstra's algorithm for finding shortest path with an example. (CO5)	10