Printed Page:- 03 **Subject Code:- AMICA0302**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
MCA Int.
SEM: III - THEORY EXAMINATION (2023 - 2024)
Subject: Data Structures

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 case of data structure operation takes maximum time? (CO1) 1

(a) Worst Case
(b) Average Case
(c) Best Case
(d) None of the above

1-b. The running time of an algorithm T(n),where n is the input size, of a recursive algorithm is given as follows.is given by T(n) =c + T(n - 1), if n > 1 d, if n ≤ 1 The order of this algorithm is (CO1) 1

(a) n
(b) n+1
(c) n-1
(d) n*1

1-c. Any arithmetic expression can be represented in any of the notation. (CO2) 1

(a) Infix expression
(b) Postfix expression
(c) Prefix expression
(d) all the above

1-d. _____ adds a new element at the TOP of the stack. (CO2) 1

(a) PUSH

(b) POP
(c) INSERT
(d) PUSH and INSERT

1-e. In circular linked list, insertion of node requires modification of? (CO3) 1

(a) One pointer
(b) Two Pointer
(c) Three Pointer
(d) None

1-f. A linear collection of data elements where the linear node is given by means of pointer is called? (CO3) 1

(a) linked list
(b) node list
(c) primitive list
(d) None of these

1-g. A complete binary tree with the property that the value at each node is at least as large as the value of its children is known as: (CO4) 1

(a) Binary Search Tree
(b) AVL Tree
(c) Completely Balance Tree
(d) Max-Heap

1-h. A Binary Tree can have (CO4) 1

(a) Can have 2 children
(b) Can have 1 children
(c) Can have 0 children
(d) All of the above

1-i. Floyd Warshall Algorithm used to solve the shortest path problem has a time complexity of _____ (CO5) 1

(a) O(V*V)
(b) O(V*V*V)
(c) O(E*V)
(d) O(E*E)

1-j. A graph having an edge from each vertex to every other vertex is called a _____ (CO5) 1

(a) Tightly Connected
(b) Strongly Connected
(c) Weakly Connected
(d) Loosely Connected

2. Attempt all parts:-

2.a.	List the advantages and disadvantages of arrays. (CO1)	2
2.b.	Define double ended queue. (CO2)	2
2.c.	How nodes are represented using python? (CO3)	2
2.d.	Balance factor of AVL tree is 0, What does it mean? (CO4)	2
2.e.	Define complete graph with an example. (CO5)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Write Python code for Bubble sort. (CO1)	6
3-b.	Explain the various operations of the list ADT with examples. (CO1)	6
3-c.	Distinguish between stack and queue. (CO2)	6
3-d.	What is stack? Write an algorithm of PUSH and POP operation on stack. (CO2)	6
3.e.	Write an algorithm to insert a node at the beginning of the singly linked list. (CO3)	6
3.f.	Explain RR rotation in AVL tree with example. (CO4)	6
3.g.	Briefly explain BFS algorithm. List any three applications of BFS algorithm. (CO5)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Write program in python to multiply two matrices. Order of matrices must be entered by user at run time. (CO1)	10
4-b.	Write an algorithm for bubble sort and write its worst case, average case and best case analysis.(CO1)	10

5. Answer any one of the following:-

5-a.	Explain Infix to postfix coversion with a suitable example. (CO2)	10
5-b.	Write a python program to implement circular queue using array. (CO2)	10

6. Answer any one of the following:-

6-a.	Write an algorithm to add two polynomials. (CO3)	10
6-b.	Explain the advantages and disadvantages of Circular linked List. (CO3)	10

7. Answer any one of the following:-

7-a.	Explain AVL tree with example. (CO4)	10
7-b.	Construct a binary tree if the in-order and pre-order traversal is given Inorder : 10, 15, 17, 18, 20, 25, 30, 35, 38, 40, 50 Preorder: 20, 15, 10, 18, 17, 30, 25, 40, 35, 38, 50 (CO4)	10

8. Answer any one of the following:-

8-a.	Explain the DFS & BFS algorithms with an example. (CO5)	10
8-b.	Explain the working of Dijikstra Algorithm with an example. (CO5)	10