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 - THEORY EXAMINATION (2024 - 2025) 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. 2026 20 **SECTION-A** 1. Attempt all parts:-1-a. An array Index starts with _____ (CO1) 1 0 (a) (b) 1 (c) 2 (d) 3 The measure of the longest amount of time possibly taken to complete an 1-b. 1 algorithm is expressed as _ . (CO1) Little-O (a) Little-Omega (b) **Big-Omega** (c) (d) Big-O/ Circular Queue is also known as _____. (CO2) 1-c. 1 (a) **Ring Buffer** (b) Square Buffer (c) **Rectangle Buffer** (d) **Curve Buffer** 1-d. Pushing an element into stack already having five elements and stack size of 5, 1 then stack becomes _____. (CO2) Overflow (a)

- (b) Crash
- (c) Underflow
- (d) User flow
- Breadth First Search is equivalent to which of the traversal in the Binary Trees? 1 1-e. (CO3)
 - Pre-order Traversal (a)
 - (b) Post-order Traversal
 - Level-order Traversal (c)
 - In-order Traversal (d)
- 1-f. Graphs are represented using (CO3)
 - Adjacency tree (a)
 - Adjacency linked list (b)
 - (c) Adjacency graph
 - Adjacency Queue (d)
- What is the average case time complexity for finding the height of the binary tree? 1 1-g. (CO4)

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- $h = O(n^2)$ (a)
- h = O(nlogn)(b)
- h = O(n)(c)
- (d) $h = O(\log n)$

2020 Which of the following is not an advantage of trees? (CO4 1-h.

- (a) Hierarchical structure
- (b) Faster search
- (c) Router algorithms
- Undo/Redo operations in a notepad (d)
- Bellmann Ford Algorithm can be applied for (CO5) 1-i.
 - Undirected graph (a)
 - Undirected and unweighted graph (b)
 - Directed and weighted graphs (c)
 - None of these (d)
- Following are a properties of the spanning tree connected to graph G: (CO5) 1 1-j.
 - A connected graph G can have more than one spanning tree. (a)
 - The spanning tree does not have any cycle (b)
 - (c) Spanning tree has n-1 edges, where n is the number of nodes
 - All The Above (d)
- 2. Attempt all parts:-
- 2.a. State the reason that why Double linked list is more useful than single linked list. 2 (CO1)

2.b.	What are benefits of circular queue ? (CO2)	2
2.c.	Explain Directed graph with example. (CO3)	2
2.d.	What is a height balanced Tree? Why height balancing of Tree is required? (CO4)	2
2.e.	Discuss the minimum spanning tree. (CO5)	2
SECTI	<u>ON-B</u>	30
3. Ansv	ver any <u>five</u> of the following:-	
3-a.	Define Sparse matrix. Write down the algorithm to convert matrix into sparse matrix. How sparse matrix is beneficial. (CO1)	6
3-b.	Define Big Theta notation with an example. (CO1)	6
3-с.	Write algorithm for insertion an element in queue. Also check for Overflow condition. (CO2)	6
3-d.	Explain & write down the algorithm for pop operation in stack. (CO2)	6
3.e.	Compare adjacency matrix and adjacency list representations of graph. (CO3)	6
3.f.	Write short note on B+ tree. along with its advantage and disadvantage.(CO4)	6
3.g.	Explain Dijkstra algorithm with an example. (CO5)	6
SECTI	<u>ON-C</u>	50
4. Ansv	ver any <u>one</u> of the following:-	
4-a.	Write down steps to delete a node from any position of a doubly linked list. Illustrate with help of an example. (CO1)	10
4-b.	What do you mean by Asymptotic Notation? (CO1)	10
5. Ansv	ver any <u>one</u> of the following:-	
5-a.	Write a program to Reverse a stack using recursion. (CO2)	10
5-b.	What is Tower of Hanoi problem? Explain solutions of Tower of Hanoi problem using proper tree representation where number of disks n= 3 and towers are labeled as A, B, C. (CO2)	10
6. Ansv	ver any <u>one</u> of the following:-	
6-a.	Explain different types of Graphs in detail with help of example. (CO3)	10
6-b.	Differentiate between DFS and BFS? (CO3)	10
7. Ansv	ver 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. 8 Дреу	Given the inorder and Preorder sequence of a binary tree, construct the original binary tree Inorder : EACKFHDBG Preorder: FAEKCDHGB Also write the Algorithm for same.(CO4)	10
o. Alisv	vor any <u>one</u> of the following	

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8-a.	Explain & write an algorithm of Quick sort with example. (CO5)	10
8-b.	What is the efficiency of Kruskal's and prims algorithm? Compare. (CO5)	10

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