Printed Page:- 04 Subject Code:- AOE0662 Roll. No: NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA (An Autonomous Institute Affiliated to AKTU, Lucknow) **B.** Tech SEM: VI - THEORY EXAMINATION (2024-2025) **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. n 20 **SECTION-A** 1. Attempt all parts:-Which of the following is a linear data structure? (CO1, K1) 1-a. 1 (a) Array AVL Tree (b) (c) **Binary Tree** (d) Graph Which is used to measure the Time complexity of an algorithm Big O notation? 1-b. 1 (CO1, K1) describes limiting behaviour of the function (a) characterises a function based on growth of function (b) upper bound on growth rate of the function (c) all of the mentioned (d) Process of removing an element from stack is called _____ (CO2, K1) 1-c. 1 (a) Create (b) Push (c) Evaluation (d) Pop 1-d. The type of expression in which operator succeeds its operands is? 1 (CO2, K2) (a) Infix expression Postfix expression (b)

- (c) Prefix expression
- Both Prefix and Postfix expression (d)

A complete binary tree with the property that the value at each node is at least as 1-e. 1 large as the value of its children is known as: (CO3, K1)

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

1-f. Height of a binary tree is.... (CO3, K1)

- MAX(Height of left Subtree, Height of right subtree)+1 (a)
- MAX(Height of left Subtree, Height of right subtree) (b)
- MAX(Height of left Subtree, Height of right subtree)-1 (c)
- (d) None of the above
- For a given graph G having 'v' vertices and 'e' edges which is connected and has 1 1-g. no cycles, which of the following statements is true? (CO4, K1)
 - (a) v=e
 - (b) v = e+1
 - v + 1 = e(c)
 - (d) v = e-1

For the adjacency matrix of a directed graph the row sum is the 1-h. 1 degree and the column sum is the _____ degree. (CO4,K2)

- in, out (a)
- (b) out, in
- in, total (c)
- (d) total, out
- If the number of records to be sorted is small, then sorting can be efficient. 1-i. 1 (CO5, K2)
 - (a) Merge
 - (b) Heap
 - (c) Selection
 - **Bubble** (d)

Which of the following is not a limitation of binary search algorithm? (CO5, K2) must use a sorted array

- requirement of sorted array is expensive when a lot of insertion and deletions are (b) needed
- (c) there must be a mechanism to access middle element directly
- (d) binary search algorithm is not efficient when the data elements more than 1500.

2. Attempt all parts:-

(a)

1-j.

2.a.	What is the difference between elementary data item and grouped data item? (CO1, K1)	2
2.b.	Define Underflow condition of Stack. (CO2, K1)	2
2.c.	What is the Depth of root node in a tree? (CO3, K1)	2
2.d.	Define degree of a node. (CO4, K1)	2
2.e.	Name different types of file organizations. (CO5, K2)	2
SECTIO	<u>N-B</u>	30
3. Answer any five of the following:-		
3-a.	Differentiate between 1-D & 2-D data array and write application for it. (CO1,K1)	6
3-b.	Write an algorithm to delete a data item from an array.(CO1,K1)	6
3-с.	What is Stack? Is stack a linear or non-linear data structure? Explain with proper reason. (CO2,K1)	6
3-d.	Write an algorithm to delete element from a queue.(CO2,K1)	6
3.e.	What is threaded binary tree? Explain two-way threaded binary tree with an example. (CO3,K2)	6
3.f.	What is the difference between directed graph and non-directed graph? Explain with the help of example. (CO4,K1)	6
3.g.	Explain Bubble Sort with example.(CO5,K1)	6
SECTIO	<u>N-C</u>	50
4. Answer any <u>one</u> of the following:-		
4-a.	Define a) Data b) Data Item c) Record d) File e) Attribute (CO1,K1)	10
4-b.	Each element of an array DATA[20][50] requires 4 bits of storage. Base address of DATA is 2000. Determine the location of DATA [10][10]. (i) Row major order. (ii) Column major order. (CO1,K4)	10
5. Answer any <u>one</u> of the following:-		
5-a.	Write the algorithm for converting infix expression to postfix (reverse polish) expression.(CO2,K1)	10
5-b.	Evaluate the following postfix expressions: P1: 5, 3, +, 2, *, 6, 9, 7, -, /, - P2: 3, 5, +, 6, 4, -, *, 4, 1, -, 2, ^, + (CO2,K1)	10
6. Answe	r any <u>one</u> of the following:-	
6-a.	Construct a binary tree if the in-order and pre-order traversal is given (CO3,K6) Inorder : 10, 15, 17, 18, 20, 25, 30, 35, 38, 40, 50 Preorder: 20, 15, 10, 18, 17, 30, 25, 40, 35, 38, 50	10
6-b.	Explain Binary tree, extended binary tree, strictly binary tree and complete binary tree. (CO3,K1)	10
7. Answer any <u>one</u> of the following:-		
7-a.	Explain BFS algorithm with an example. List any three applications of BFS algorithm. (CO4,K1)	10
7-b.	Explain DFS algorithm with an example. List any three applications of DFS	10

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algorithm. (CO4,K1)

8. Answer any one of the following:-

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- 8-a. Write down algorithm of Merge Sort and analyze the complexity of Merge 10 Sort. (CO5,K1)
- 8-b. Write an algorithm to sort the data in ascending order using selection sort and sort 10 77,33,44,11,88,22,66,55. Show steps. (CO5,K2)

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