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**NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA**  
(An Autonomous Institute Affiliated to AKTU, Lucknow)

**B.Tech**

**SEM: III - THEORY EXAMINATION (2025- 2026)**

**Subject: Data Structures**

**Time: 2 Hours**

**Max. Marks: 50**

**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**

15

1. Attempt all parts:-

- 1-a. Which of the following is false about a doubly linked list? (CO1, K2) 1
- (a) We can navigate in both the directions
  - (b) It requires more space than a singly linked list
  - (c) The insertion and deletion of a node take a bit longer
  - (d) Implementing a doubly linked list is easier than singly linked list
- 1-b. In STACK new element is PUSHED at..... (CO2, K2) 1
- (a) Top of the stack
  - (b) End of the stack
  - (c) Middle of the stack
  - (d) None
- 1-c. A path ending in a ..... is called a branch. (CO3, K2) 1
- (a) leaf
  - (b) node
  - (c) edge
  - (d) tree
- 1-d. Graphs are represented by cost adjacency matrices, where cost represents edge\_\_\_\_\_. (CO4, K4) 1
- (a) vertex
  - (b) point
  - (c) weight
  - (d) none

- 1-e. What is the best case complexity of Linear Search? (CO5, K2) 1
- (a)  $O(n)$
  - (b)  $O(1)$
  - (c)  $O(\log n)$
  - (d)  $O(n*n)$

2. Attempt all parts:-

- 2.a. Define Big Oh notation. (CO1, K1) 2
- 2.b. What is Priority Queue? (CO2, K2) 2
- 2.c. Write down algorithm for Post-order tree traversal. (CO3, K2) 2
- 2.d. What do you mean by spanning tree? (CO4, K2) 2
- 2.e. Which one is fastest out of Bubble sort, Quick Sort and Insertion Sort? (CO5, K3) 2

### **SECTION-B**

15

3. Attempt all parts:-

3.a. Answer any one of the following:-

- 3.a.(i) Explain difference between the linked list and linear array. (CO1, K2) 3
- 3.a.(ii) Calculate the address of element A [1, 2] and A[4,2] in a matrix is of  $10*10$  order using a) Row major representation and b) Column major representation.(CO1, K5) 3

3.b. Answer any one of the following:-

- 3.b.(i) What is the difference between queue and D-queue? (CO2, K2) 3
- 3.b.(ii) Explain with neat diagram the deletion and insertion of an element into the queue. (CO2,K2) 3

3.c. Answer any one of the following:-

- 3.c.(i) Construct a BST using these elements: 38, 46, 13, 9, 87, 17, 24, 18,43,2. (CO3,K5) 3
- 3.c.(ii) What is Threaded binary tree? Write its advantages. Explain the types of Threaded binary trees in detail. (CO3,K2) 3

3.d. Answer any one of the following:-

- 3.d.(i) Write an algorithm for Binary Search. (CO4,K2) 3
- 3.d.(ii) Explain Kruskal's algorithm with an example. Discuss its applications in real life. (CO4,K6) 3

3.e. Answer any one of the following:-

- 3.e.(i) What do you understand by file organization? Differentiate Indexed and Random file organization. (CO5,K2) 3
- 3.e.(ii) Write an algorithm to sort the data in ascending order using insertion sort and sort 77,33,44,11,88,22,66,55. (CO5,K2) 3

### **SECTION-C**

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4. Answer any one of the following:-

- 4-a. Explain non-linear data structure in detail with example. (CO1, K2) 4
- 4-b. Write a function to delete a given node from a singly linked list. (CO1, K2) 4

5. Answer any one of the following:-

- 5-a. Convert the infix expression to postfix expression.(A-B)/((D+E) \* F). (CO2, K3) 4

- 5-b. Write an algorithm to insert and delete an element into the STACK. (CO2, K2) 4
6. Answer any one of the following:-
- 6-a. What are the properties of Max-heap? (CO3, K2) 4
- 6-b. Explain the array representation of BST in memory. (CO3, K2) 4
7. Answer any one of the following:-
- 7-a. Write the dijkstra algorithm and explain with example. (CO4, K2) 4
- 7-b. Explain Depth First Search (DFS) with an example. (CO4, K2) 4
8. Answer any one of the following:-
- 8-a. Sort the sequence 3,1,4,5,9,2,6,5 using insertion sort. (CO5, K2) 4
- 8-b. Explain Quick Sort with example. (CO5, K2) 4

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