.

Printed Page:-4 **Subject Code:- CBCA0201**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
BCA
SEM: II - THEORY EXAMINATION (2025 - 2026)
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:-

(1.1) In binary search, the array must be:(K2)[CO1] 1

(a) Unsorted
(b) Reversed
(c) Sorted
(d) Multidimensional

(1.2) What happens when an invalid index is accessed in an array? (K2)[CO1] 1

(a) IndexError
(b) ValueError
(c) TypeError
(d) MemoryError

(1.3) Identify the operation not applicable in a postfix evaluator. (K1)[CO2] 1

(a) Push operand
(b) Pop two operands
(c) Apply operator
(d) Enqueue element

(1.4) Select the default behavior of a stack. (K2)[CO2] 1

(a) LIFO
(b) FIFO
(c) Priority-based
(d) Random

(1.5) Pick the correct combination for polynomial addition using linked lists. (K4)[CO3] 1

(a) Coefficient and exponent
(b) Value and index
(c) Data and weight
(d) Key and position

(1.6) Choose the list that allows circular traversal without NULL checks. (K2)[CO3] 1

(a) Doubly list
(b) Singly list
(c) Circular list
(d) Hash table

(1.7) Choose the structure used by Threaded Binary Trees. (K3)[CO4] 1

(a) Stack
(b) Queue
(c) Deque
(d) Pointer Threads

(1.8) Choose the traversal where root node is processed first. (K3)[CO4] 1

(a) Preorder
(b) Inorder
(c) Postorder
(d) Reverse

(1.9) How does the DFS algorithm explore a graph? (K2)[CO5] 1

(a) It uses a queue
(b) It uses recursion and a stack
(c) It explores each node level by level
(d) It uses iterative methods

(1.10) Which of the following algorithms can detect a cycle in an undirected graph? (K2)[CO5] 1

(a) Depth-first search
(b) Dijkstra's algorithm
(c) Kruskal's algorithm
(d) Prim's algorithm

2. Attempt all parts:-

(2.1) Explain the significance of base address in array index calculations. (K2)[CO1] 2

(2.2) Define tail recursion and mention one advantage of using it. (K1)[CO2] 2

(2.3) Identify an application of circular linked lists in real-world scheduling. (K1)[CO3] 2

(2.4) Describe self balancing tree. (K1)[CO4] 2

(2.5) List any four common sorting algorithms. (K1)[CO5] 2

SECTION-B 30

Answer any one of the following:-

(3.1) Analyze the time complexity of insertion and deletion operations in arrays. (K4)[CO1] 6

.

(3.2)	Describe the advantages and limitations of using arrays. (K2)[CO1]	6

Answer any one of the following:-

(3.3)	Show how insertion and deletion are handled in a dequeue (double-ended queue). (K3)[CO2]	6
(3.4)	Explain the enqueue operations in a linear queue. (K2)[CO2]	6

Answer any one of the following:-

(3.5)	Differentiate between doubly linked list and circular linked list. (K3)[CO3]	6
(3.6)	Illustrate with a diagram the internal structure and working of a singly linked list. (K3)[CO3]	6

Answer any one of the following:-

(3.7)	Create a Binary Search Tree for the following data and do in-order, Preorder and Post-order traversal of the tree. 50, 60, 25, 40, 30, 70, 35, 10, 55, 65, 5. (K6)[CO4]	6
(3.8)	Explain the Right Rotation (RR Rotation) in an AVL tree with a suitable diagram. (K3)[CO4]	6

Answer any one of the following:-

(3.9)	Describe open addressing collision resolution techniques . (K2)[CO5]	6
(3.10)	Explain Bubble sort with example. (K2)[CO5]	6

SECTION-C 50

4. Answer any one of the following:-

(4.1)	Illustrate the use of row-major and column-major order in 2-D array with example. (K3)[CO1]	10
(4.2)	Provide the characteristics of linear and non-linear data structures with suitable examples. Compare arrays, linked lists, stacks, and queues with trees and graphs. (K3)[CO1]	10

5. Answer any one of the following:-

(5.1)	Convert the following infix expression to prefix: P - (Q / R * S + T) + U * V (K3)[CO2]	10
(5.2)	Distinguish between stack and queue.[CO2]	10

6. Answer any one of the following:-

(6.1)	Describe the following terms related to doubly linked list with examples: node, prev pointer, next pointer, bidirectional traversal, role of NULL pointer in the first and last nodes. (K2)[CO3]	10
(6.2)	Formulate an algorithm to insert a node at a specific position in a linked list. (K6)[CO3]	10

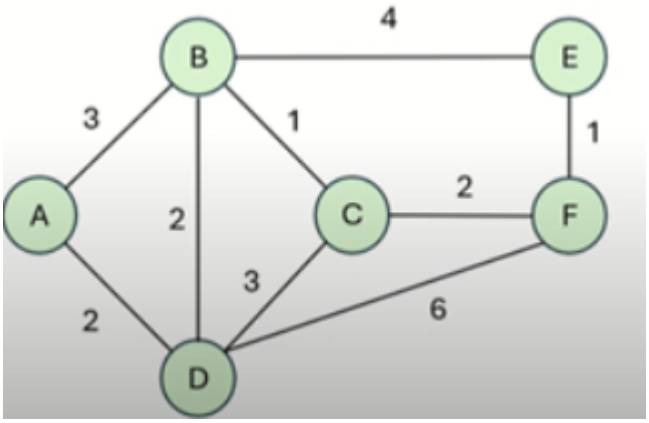
7. Answer any one of the following:-

(7.1)	Trace an algorithm to delete the nodes from BST. (K3)[CO4]	10
(7.2)	Build a max-heap for the sequence [90, 80, 85, 70, 75, 65, 60, 55, 50, 45]. Then delete 90, 45, 80 in order and show the final tree. (K6)[CO4]	10

8. Answer any one of the following:-

(8.1)	Using Dijkstra's algorithm, find the shortest path from vertex A to all other vertices. Show the table of distances at each iteration and the final shortest path tree.	10

(K4)[CO5]



(8.2) Consider the following graph, and find the shortest path from vertex A to all other vertices using the bellman ford algorithm. (K3)[CO5] 10