

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

MCA

SEM: II - THEORY EXAMINATION (20..... - 20.....)

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. The worst case complexity of Binary Search is (CO1, K1) 1

- (a) $O(1)$
- (b) $O(n)$
- (c) $O(\log n)$
- (d) $O(n \log n)$

1-b. An algorithm that indicates the amount of temporary storage required for running the algorithm, i.e., the amount of memory needed by the algorithm to run to completion is termed as _____. (CO1, K1) 1

- (a) Big Theta Θ (f)
- (b) Space complexity
- (c) Big Oh O (f)
- (d) None of the above

1-c. Out of the following operators ($\wedge$, $*$, $+$, $\&$, $\$$), find the one having highest priority is _____. (CO2, K1) 1

- (a) $+$
- (b) $\$$
- (c) $\wedge$
- (d) $\&$

1-d. write the result for the following postfix expression 1

$abc*+de*f+g*+$ where $a=1, b=2, c=3, d=4, e=5, f=6, g=2$. (CO2, K3)

- (a) 76
- (b) 59
- (c) 80
- (d) none of these

1-e. Which of the following operations is performed more efficiently by doubly linked list than by singly linked list? (CO3, K1) 1

- (a) Deleting a node whose location is given
- (b) Searching of an unsorted list for a given item
- (c) Inverting a node after the node with given location
- (d) Traversing a list to process each node

1-f. In a doubly linked lists, traversal can be performed. (CO3, K1) 1

- (a) Only in forward direction
- (b) Only in reverse direction
- (c) In both directions
- (d) None

1-g. Consider a node X in a Binary Tree. Given that X has two children, let Y be Inorder successor of X. Which of the following is true about Y? (CO4, K3) 1

- (a) Y has no right child
- (b) Y has no left child
- (c) Y has both children
- (d) None of the above

1-h. The height of a binary tree is the maximum number of edges in any root to leaf path. The maximum number of nodes in a binary tree of height h is: (CO4, K2) 1

- (a) $2^h - 1$
- (b) $2^{(h-1)} - 1$
- (c) $2^{(h+1)} - 1$
- (d) $2 * (h+1)$

1-i. A connected graph T without any cycles is called (CO5, K1) 1

- (a) Finding the shortest path in a weighted graph
- (b) Finding the shortest path in a unweighted graph
- (c) Constructing a minimum spanning tree
- (d) Performing topological sorting

1-j. Which of the following is false regarding edges of graph? (CO5, K1) 1

- (a) Depends on a Graph
- (b) Will always be zero
- (c) Will always be greater than zero
- (d) May be zero or greater than zero

2. Attempt all parts:-

- | | | |
|------|--|---|
| 2.a. | What are the disadvantages of arrays. (CO1, K2) | 2 |
| 2.b. | Define double ended queue. (CO2, K1) | 2 |
| 2.c. | Explain the advantages and disadvantages of using Linked List in Polynomial. (CO3, K2) | 2 |
| 2.d. | Draw a full binary tree with at least 6 nodes. (CO4, K3) | 2 |
| 2.e. | Define adjacency list with an example. (CO5, K1) | 2 |

SECTION-B

30

3. Answer any five of the following:-

- | | | |
|------|--|---|
| 3-a. | Write down linear search algorithm and by using this find the location of 33 in 23,12,33,10,23,4 (CO1, K3) | 6 |
| 3-b. | Explain Selection Sort with example. Also write its algorithm. (CO1, K2) | 6 |
| 3-c. | How is Direct recursion different from indirect recursion. (CO2, K2) | 6 |
| 3-d. | What are the advantages and disadvantages of Circular queue? (CO2, K2) | 6 |
| 3.e. | Write a function to create a circular linked list (CO3, K3) | 6 |
| 3.f. | Create an AVL Tree using 39, 56, 2, 9, 87, 7, 23, 19. (CO4, K5) | 6 |
| 3.g. | Write Prims algorithm to find minimum spanning tree. (CO5, K2) | 6 |

SECTION-C

50

4. Answer any one of the following:-

- | | | |
|------|--|----|
| 4-a. | What is Asymptotic Notation? Explain Big-O, Omega and Theta notations with example. (CO1, K2) | 10 |
| 4-b. | Write down Binary Search Algorithm and using this algorithm search 14 from the list: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20. Show steps. (CO1, K3) | 10 |

5. Answer any one of the following:-

- | | | |
|------|--|----|
| 5-a. | Convert the infix $(a+b)*(c+d)/f$ into postfix & prefix (CO2, K3) | 10 |
| 5-b. | Explain the steps involved in insertion and deletion into a singly and doubly linked list. (CO2, K2) | 10 |

6. Answer any one of the following:-

- | | | |
|------|---|----|
| 6-a. | What is doubly linked list? Write a python program to create and display a doubly linked list. (CO3, K2) | 10 |
| 6-b. | Write functions in Python to delete a node (i) at beginning, (ii) at the end in a doubly linked list. Illustrate with an example. (CO3, K3) | 10 |

7. Answer any one of the following:-

- | | | |
|------|---|----|
| 7-a. | Make a binary search tree for the following sequence of numbers: 45, 36, 76, 23, 89, 115, 98, 39, 41, 56, 69, 48. Traverse the tree in Preorder, Inorder and Postorder. (CO4, K3) | 10 |
| 7-b. | Give the analysis of insertion and deletion operations of nodes in binary search tree. (CO4, K2) | 10 |

8. Answer any one of the following:-

- 8-a. What is minimum –cost spanning tree? Discuss Kruskal’s algorithm with example (CO5, K2) 10
- 8-b. Differentiate BFS and DFS. (CO5, K4) 10

REG:JAN_JUN-2025