Printed Page:- 03 **Subject Code:- BMCA0102**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

MCA

SEM: I - THEORY EXAMINATION (2023-2024)

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. Space complexity of an algorithm is the maximum amount of _____ required by it during execution. (CO1) 1

(a) Time
(b) Operations
(c) Memory space
(d) None of the above

1-b. This characteristic often draws the line between what is feasible and what is impossible. (CO1) 1

(a) Performance
(b) System Evaluation
(c) Modularity
(d) Reliability

1-c. Recursion is similar to which of the following?(CO2) 1

(a) switch case
(b) loop
(c) if-else
(d) if elseif else

1-d. The necessary condition to be checked before deletion from the Queue is__ (CO2) 1

(a) overflow

(b) underflow
(c) Rea value
(d) Front value

1-e. In Single linked lists, traversal can be performed? (CO3) 1

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

1-f. Linked list data structure offers considerable saving in _____(CO3) 1

(a) Space Utilization and Computational Time
(b) Computational Time
(c) Space Utilization
(d) Speed Utilization

1-g. On which algorithm is heap sort based on?(CO4) 1

(a) fibbonacci heap
(b) binary tree
(c) priority queue
(d) FIFO

1-h. What is the speciality about the inorder traversal of a binary search tree?(CO4) 1

(a) It traverses in a non increasing order
(b) It traverses in an increasing order
(c) It traverses in a random fashion
(d) It traverses based on priority of the node

1-i. Consider a complete graph G with 4 vertices. The graph G has ..... spanning trees. (CO5) 1

(a) 15
(b) 8
(c) 16
(d) 13

1-j. Which of the following is false in the case of a spanning tree of a graph G?(CO5) 1

(a) It is tree that spans G
(b) It is a subgraph of the G
(c) It includes every vertex of the G
(d) It can be either cyclic or acyclic

2. Attempt all parts:-

2.a. Write any two characteristics of a good hash function. (CO1) 2

2.b. How is Stack different from a Queue?(CO2) 2

2.c. How can we delete the first node from the singly linked list?(CO3) 2

2.d.	Explain Threaded Binary Tree.(CO4)	2
2.e.	Define minimum spanning tree.(CO5)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Explain Bubble Sort with example by showing all steps.(CO1)	6
3-b.	Explain Row Major order Representation with example.(CO1)	6
3-c.	Classify different types queues in details.(CO2)	6
3-d.	Write and explain deletion algorithm of stack.(CO2)	6
3.e.	How will you represent a linked list in a graphical view?(CO3)	6
3.f.	What are the properties of Max-heap?(CO4)	6
3.g.	Write a function in Python for DFS traversal. (CO5)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Write down algorithm of Merge Sort and analyze the time and space complexity of Merge Sort.(CO1)	10
4-b.	Write down Bubble Sort algorithm and using this algorithm sort: 38, 27, 43, 3, 9, 82, 10 in ascending order. Show steps also.(CO1)	10

5. Answer any one of the following:-

5-a.	Explain Stack implementation using Link list and also write at least 5 application of stacks from real life. (CO2)	10
5-b.	Explain Tower of Hanoi problem and write its code using recursion. (CO2)	10

6. Answer any one of the following:-

6-a.	Explain the advantages and disadvantages of Circular linked List.(CO3)	10
6-b.	Write a program in Python for multiplication of two polynomials represented by linked list. (CO3)	10

7. Answer any one of the following:-

7-a.	Explain extended binary tree, full binary tree, strictly binary tree and complete binary tree with example.(CO4)	10
7-b.	Define AVL tree. What is a balance factor in AVL trees? Explain various rotations performed on AVL trees.(CO4)	10

8. Answer any one of the following:-

8-a.	Explain Divide and conquer algorithm with an example.(CO5)	10
8-b.	Explain the breadth first search algorithm with an example. (CO5)	10