Printed Page:- 04 **Subject Code:- BCSBS0203**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: II - THEORY EXAMINATION (2023 - 2024)

Subject: Data Structures & Algorithms

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. To verify whether a function grows faster or slower than the other function, we have some asymptotic or mathematical notations, which is_____.(CO1) 1

(a) Big Omega Ω (f)

(b) Big Theta θ (f)

(c) Big Oh O (f)

(d) All of the above

1-b. Which of the following notation used to represent lower bound of complexity. (CO1) 1

(a) Big-Oh

(b) Big-Theta

(c) Big-Omega

(d) All of the above

1-c. Which of the following function is used to de-allocate memory, allocated dynamically. (CO2) 1

(a) malloc()

(b) calloc()

(c) free()

(d) realloc()

1-d. Which of the following is/are application of stack (CO2) 1

(a) Recursion

(b) Permutation

(c) Polish Notation

(d) All of Above

1-e. Which of the following tree has left child less than parent and right child greater than parent. (CO3) 1

(a) Binary search tree

(b) AVL tree

(c) B-tree

(d) All of above

1-f. Time complexity of search operation in AVL tree is. (CO3) 1

(a) O(n)

(b) O(nlogn)

(c) O(logn)

(d) O(n*n)

1-g. What is the wrost case time complexity of sequential search. (CO4) 1

(a) O(1)

(b) O(n)

(c) O(nlogn)

(d) O(n*n)

1-h. A sorting technique is called stable if: (CO4) 1

(a) It takes O(n*log(n)) time

(b) It maintains the relative order of occurrence of non-distinct elements

(c) It uses divide and conquer paradigm

(d) It takes O(n) space

1-i. Which of the following is true about graph. (CO5) 1

(a) Linear Data Structure

(b) Non-Linear Data Structure

(c) Both a and b

(d) None of the above

1-j. Files are logically partitioned into storage units of fixed-length known as_____ (CO5) 1

(a) Sectors

(b) Track

(c) Segment

(d) Block

2. Attempt all parts:-

2.a. Define space complexity of an algorithm (CO1) 2

2.b. Create a structure to define singly link list (CO2) 2

2.c. Write short on B+ -Tree.(CO3) 2

2.d. Write short note on linear search. (CO4) 2

2.e. Write short note on directed graph. (CO5) 2

SECTION B **30**

3. Answer any <u>five</u> of the following:-

3-a. List the four basic Operations of Data structures. (CO1) 6

3-b. Define algorithms and wirte its characteristics. (CO1) 6

3-c. Write algorithm for enqueue and dequeue operation in circular queue. (CO2) 6

3-d. Explain and implement a single linked list with an example. Also write a algorithm for deletion at end. (CO2) 6

3.e. Write algorithm for insertion and deletion in binary search tree. (CO3) 6

3.f. Desribe open addressing technique of collision resolution. (CO4) 6

3.g. Explain Breadth First Search traversal of Graph using an example. (CO5) 6

SECTION C **50**

4. Answer any <u>one</u> of the following:-

4-a. Write short note on following asymptotic notation (CO1): 10
1) Big-Oh. 2) Big-Theta. 3) Big-Omega.

4-b. Explain classification of data structure. (CO1) 10

5. Answer any <u>one</u> of the following:-

5-a. Define 2-D array. Explain memory management of 2-D array with their memory access formula. (CO2) 10

5-b. Write application of stack with example. (CO2) 10

6. Answer any <u>one</u> of the following:-

6-a.	Define AVL tree. Explain the term balance factor in AVL tree. Describe various rotations performed on AVL tree with the help of neat diagram. (CO3)	10
6-b.	Write the characteristics of a B-Tree of order m. Create B-Tree of order 5 from the following lists of data items :20, 30, 35, 85, 10, 55, 60, 25, 5, 65, 70, 75, 15, 40, 50, 80, 45. (CO3)	10

7. Answer any <u>one</u> of the following:-

7-a.	Explain different types of hash functions with example.(CO4)	10
7-b.	Define heap sort. Sort following elements using heap sort: 81, 89, 9, 11, 14, 76, 54, 22. (CO4)	10

8. Answer any <u>one</u> of the following:-

8-a.	Explain Prim's algorithm of findng minimum spanning tree with an example. (CO5)	10
8-b.	Define minimum spanning tree and also explain kruskal's algorithm of findng minimum spanning tree with an example. (CO5)	10