Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

MCA

SEM: II - THEORY EXAMINATION (2021 - 2022)

Subject: Data Structures and Analysis of Algorithm

Time: 3 Hours   Max. Marks: 100

General Instructions:

1. The question paper comprises three sections, A, B, and C. You are expected to answer them as directed.

2. Section A - Question No- 1 is 1 marker & Question No- 2 carries 2 marks each.

3. Section B - Question No-3 is based on external choice carrying 6 marks each.

4. Section C - Questions No. 4-8 are within unit choice questions carrying 10 marks each.

5. 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.   What is the difference between a flowchart and a pseudocode? (CO1)   1

(a) A flowchart is textual but the pseudocode is a diagram

(b) A flowchart is a schematic description of an algorithm, while pseudocode is a textual description of an algorithm.

(c) A flowchart and a pseudocode are the same

(d) A flowchart is a diagram while the pseudocode is written in a programming language Java

1-b.   Which of the following cases does not exist in the complexity theory? (CO1)   1

(a) Best case

(b) Worst case

(c) Average case

(d) Null case

1-c.   A data structure in which elements can be inserted or deleted at/from both ends but not in the middle is? (CO2)   1

(a) Queue

(b) Circular queue

(c) Dequeue

(d) Priority queue

1-d.   What is the other name for a postfix expression? (CO2)   1

       (a) Normal polish Notation

       (b) Reverse polish Notation

       (c) Warsaw notation

       (d) Infix notation

1-e.   For the best case input, the running time of an insertion sort algorithm is? (CO3)   1

       (a) Linear

       (b) Binary

       (c) Quadratic

       (d) Depends on the input

1-f.   Which of the following ways can be used to represent a graph? (CO3)   1

       (a) Adjacency List and Adjacency Matrix

       (b) Adjacency List, Adjacency Matrix and Incidence Matrix

       (c) Adjacency List and Incidence Matrix

       (d) None of These

1-g.   What is the possible number of binary trees that can be created with 3 nodes, giving the   1
sequence N, M, L when traversed in post-order (CO4)

       (a) 15

       (b) 3

       (c) 5

       (d) 8

1-h.   Which of the following pair's traversals on a binary tree can build the tree uniquely? (CO4)   1

       (a) post-order and pre-order

       (b) post-order and in-order

       (c) post-order and level order

       (d) level order and preorder

1-i.   Best case complexity of QuickSort is: (CO5)   1

       (a) O(log N)

       (b) O(N log N)

(c) O(N)

(d) None of these

1-j.   A _____ in a graph G is a circuit which consists of every vertex (except first/last vertex) of   1
G exactly once.(CO5)

(a) Euler path

(b) Hamiltonian path

(c) Planar graph

(d) Path complement graph

2. Attempt all parts:-

2.a.	Define Dynamic memory allocation. (CO1)	2
2.b.	What are benefits of circular queue ? (CO2)	2
2.c.	Draw a directed graph with five vertices & seven edges. (CO3)	2
2.d.	Define Complete Binary Tree and its features. (CO4)	2
2.e.	Define Negative Weight in a graph with Example. (CO5)	2

SECTION B   30

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

3-a.	Write a function to delete a node from the end of linked list. (CO1)	6
3-b.	List down the properties of Algorithm. Write algorithm to search an element in an array. (CO1)	6
3-c.	Convert the given infix expression to prefix using stack: A*(B+D)/E-F*(G+H/K). (CO2)	6
3-d.	Write algorithm for deletion of an element in circular queue. Also check for Overflow condition. (CO2)	6
3.e.	Compare adjacency matrix and adjacency list representations of graph. (CO3)	6
3.f.	What is binary search tree(BST)? Suppose the numbers 7, 5, 1, 8, 3, 6, 0, 9, 4, 2 are inserted in that order into an initially empty binary search tree. Make the binary search tree. (CO4)	6
3.g.	Discuss the Partition Algorithms with an example. (CO5)	6

SECTION C   50

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

4-a.	Write a program in C to perform insertion and deletion operations in circular linked list. (CO1)	10
4-b.	Write a program in C to sort elements of the array in descending order. (CO1)	10

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

5-a.   The keys 12, 18, 13, 2, 3, 23, 5 and 15 are inserted into an initially empty hash table of length 10 using open addressing with hash function h(k) = k mod 10 and linear probing. What is the resultant hash table? (CO2)   10

5-b.   What is Tower of Hanoi problem? Explain solutions of Tower of Hanoi problem using proper tree representation where number of disks n= 3 and towers are labeled as A, B, C. (CO2)   10

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

6-a.   Explain at least five applications of Depth First Search in detail (CO3)   10

6-b.   What is heap? Differentiate between max-heap and min-heap. Build a Max-heap H of the following elements : 60,33,50,22,55,40,11,22,65,30 (CO3)   10

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

7-a.   Given the inorder and Preorder sequence of a binary tree, construct the original binary tree   10
        Inorder : EACKFHDBG
        Preorder: FAEKCDHGB
        Also write the Algorithm for same.(CO4)

7-b.   Insert elements 12, 5, 89, 33, 61, 49, 22, 17 and 20 in an initially empty AVL tree . Show proper rotation to maintain the tree as AVL. (CO4)   10

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

8-a.   Determine an LCS of <1, 0, 0,1, 0, 1, 0,1> and <0, 1, 0, 1, 1, 0, 1, 1, 0> (CO5)   10

8-b.   Define Single Source problem. Explain Dijkstra's Algorithm in detail with example and analyze its efficiency. (CO5)   10