Printed Page:- Subject Code:- AMCA0203N

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

MCA

SEM: III - CARRY OVER THEORY EXAMINATION - SEPTEMBER 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. Which of the following case exist in complexity theory? (CO1) 1

(a) Best case

(b) Worst case

(c) Average case

(d) All of the mentioned

1-b. What is an algorithm? (CO1) 1

(a) A flowchart

(b) Step by step instructions used to solve a problem

(c) A decision

(d) None of These

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. The optimal data structure used to solve Tower of Hanoi is _____.(CO2) 1

(a) Tree

(b) Heap

(c) Priority queue

(d) Stack

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. A full binary tree can be generated using _____. (CO4) 1

(a) post-order and pre-order traversal

(b) pre-order traversal

(c) post-order traversal

(d) in-order traversal

1-h. What is the worst-case number of arithmetic operations performed by recursive binary search on a sorted array of size n? (CO4) 1

(a) $\theta(n)$

(b) $\theta(\sqrt{n})$

(c) $\theta(\log_2(n))$

(d) $\theta(n2)$

1-i. Average case time complexity of merge sort. (CO5) 1

(a) O(n log n)

(b) O(log n)

(c) O(log log n)

(d) None of These

1-j. Best case time complexity of merge sort. (CO5) 1

(a) O(n log n)

(b) O(log log n)

(c) O(log n)

(d) All the Above

2. Attempt all parts:-

2.a. Define Linked list and their types. (CO1) 2

2.b. write the steps involved in insertion of an element in stack. (CO2) 2

2.c. Define graph with an example. (CO3) 2

2.d. Create an AVL Tree for the following elements: a, z, b, y, c, x, d, w, e, v, f. (CO4) 2

2.e. Define Greedy Programming. (CO5) 2

SECTION B 30

3. Answer any five of the following:-

3-a. Differentiate between Array and Linked list. (CO1) 6

3-b. Explain all types of linked list available in detail. (CO1) 6

3-c. Convert infix to postfix 6

(A+B)*(C+D)

A+B+C+D (CO2)

3-d. Define searching? List different types of searching available? Write algorithm for linear search. (CO2) 6

3.e. Differentiate between Bubble and selection sort. (CO3) 6

3.f. Write down the short notes on (i)Strictly Binary Tree (ii) Complete Binary Tree (iii)Extended Binary Tree (iv)Threaded Binary Tree. (CO4) 6

3.g. Define Dijkstra's algorithm. Write down the algo for it. (CO5) 6

SECTION C 50

4. Answer any one of the following:-

4-a. Write a program in C to delete the node at the end of a circular linked list. (CO1) 10

4-b. Write a program in C to insert a new node at any position in a doubly linked list.(CO1) 10

5. Answer any one 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 10

length 10 using open addressing with hash function h(k) = k mod 10 and linear probing. What is the resultant hash table? (CO2)

5-b. Define application of queue in data Structure and Applications of Priority Queue. (CO2) 10

6. Answer any one of the following:-

6-a. Write a C program to sort a list of elements using the bubble sort algorithm and Insertion sort write algorithm of both. (CO3) 10

6-b. Define Breadth First Traversal. Illustrate the algorithm with help of example. (CO3) 10

7. Answer any one of the following:-

7-a. Given the following sequence construct a binary tree Inorder : { 4, 2, 1, 7, 5, 8, 3, 6 } Preorder : { 1, 2, 4, 3, 5, 7, 8, 6 }Write down the algorithm for it. (CO4) 10

7-b. Find all possible binary trees with given Inorder Traversal And Algorithm of it. (CO4) 10

8. Answer any one of the following:-

8-a. Analyze the best, average and worst case complexity of quick sort. (CO5) 10

8-b. Which Algorithm uses divide and Conquer technology. explain in details. (CO5) 10