Printed Page:- Subject Code:- ACSIOT0301

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech.

SEM: III - CARRY OVER THEORY EXAMINATION - JUNE (2021 - 2022)

Subject: Data Structures and Algorithms Design

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 mark 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 Which of the following is not the correct statement for a stack data structure?[CO1] 1

(a) Arrays can be used to implement the stack

(b) Stack follows FIFO

(c) Elements are stored in a sequential manner

(d) Top of the stack contains the last inserted element

1 To represent hierarchical relationship between elements, which data structure is suitable?[CO1] 1

(a) Dequeue

(b) Prioriy

(c) Tree

(d) Graph

1-c. The algorithms like merge sort, quick sort and binary search are based on. [CO2] 1

(a) Greedy algorithm

(b) Divide and Conquer algorithm

(c) Hash table

(d) Parsing

1-d. Which of the following algorithm design techniques is used in the quick sort algorithm?[CO2] 1

(a) Dynamic programming

(b) Backtracking

(c) Divide and conquer

(d) Greedy method

1-e. A linear collection of data elements where the linear node is given by means of pointer is called?[CO3] 1

(a) Node list

(b) Unordered list

(c) Primitive list

(d) Linked list

1-f. The time complexity of enqueue operation in Queue is __.[CO3] 1

(a) O(1)

(b) O(n)

(c) O(logn)

(d) O(nlogn)

1	A Binary Tree can have [CO4] (a) Can have 2 children (b) Can have 1 children (c) Can have 0 children (d) All of the above	1
1	A complete binary tree with the property that the value at each node is at least as large as the value of its children is known as:[CO4] (a) Binary Search Tree (b) AVL Tree (c) Completely Balance Tree (d) Max-Heap	1
1	A graph with all vertices having equal degree is known as a _____.[CO5] (a) Multi Graph (b) Regular Graph (c) Simple Graph (d) Complete Graph	1
1	Floyd Warshall Algorithm used to solve the shortest path problem has a time complexity of _____.[CO5] (a) O(V*V) (b) O(V*V*V) (c) O(E*V) (d) O(E*E)	1

2. Attempt all parts:-

2.a.	What are the advantages in the array implementation of list?[CO1]	2
2.b.	Write any two characteristics of Greedy Algorithm? [CO2]	2
2.c.	What is the Complexity of Algorithm?[CO3]	2
2.d.	Mention various points of difference between complete binary tree and almost complete binary tree.[CO4]	2
2.e.	Explain Breadth First Search traversal of Graph using an example.[CO5]	2

SECTION B 30

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

3	Explain Selection Sort with the help of example.[CO1]	6
3	Define the terms in brief: Time complexity, Space Complexity, Big O Notation.[CO1]	6
3	Mention some methods for choosing the pivot element in quick sort?[CO2]	6
3	Sort the sequence 2,4,5,7,1,2,3,6 using Merge sort. Show all the required steps.[CO2]	6
3.e.	Write and explain algorithm for Linear search.[CO3]	6
3.f.	Explain Inorder, Preorder and Postorder Traversal operation on Binary tree with example. [CO4]	6
3.g.	Discuss following with reference to graphs. (i) Directed graph (ii) Undirected graph (iii) Degree of vertex (iv)Null graph (v) Acyclic Graph [CO5]	6

SECTION C 50

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

4-a.	Interpret an algorithm to sort a set of ‘N’ numbers using bubble sort and demonstrate the sorting steps for the following set of numbers: 88,11,22,44,66,99,32,67,54,10.[CO1]	10

4-b.	What is queue? Why it is known as FIFO? Write an algorithm to insert and delete an element from a simple queue with Example.[CO1]	10
5. Answer any one of the following:-		
5-a.	Explain working of binary search and linear search technique with example in details.[CO2]	10
5-b.	What is dynamic programming? Design an algorithm to solve the 0/1 knapsack problem using Dynamic programming.[CO2]	10
6. Answer any one of the following:-		
6-a.	Write a procedure which removes the first element of a list and adds it to the end of the list without changing any values in INFO.(Only START and LINK may be changed.[CO3]	10
6-b.	Why doubly linked list is better than linked list ? Justify it by taking suitable example.[CO3]	10
7. Answer any one of the following:-		
7-a.	Construct a height balanced Binary search tree by performing following operations: [CO4] Step 1: Insert 19, 16, 11, 17, 25, 6, 13 Step 2: Insert 3 Step 3: Delete 16	10
7-b.	Write function / program for Heapsort . Explain with example . [CO4]	10
8. Answer any one of the following:-		
8	Discuss the prim's algorithm for minimum spanning tree. Give an example.[CO5]	10
8	Explain Dijkstra Algorithm. Discuss its applications in real life.[CO5]	10