Printed Page:- Subject Code:- ACSE0301

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 - SEPTEMBER 2022

Subject: Data Structures

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-a. Average case time complexity of quicksort is_____? (CO1) 1

(a) O(n)

(b) O(n^2)

(c) O(n lgn)

(d) O(lg n)

1-b. Which of the following is the disadvantage of the array? (CO1) 1

(a) Stack and Queue data structures can be implemented through an array.

(b) Index of the first element in an array can be negative

(c) Wastage of memory if the elements inserted in an array are lesser than the allocated size

(d) Elements can be accessed sequentially.

1-c. In a stack, if a user tries to remove an element from an empty stack it is called _____. (CO2) 1

(a) Underflow

(b) Empty collection

(c) Overflow

(d) Garbage Collection

1-d. The data structure required to check whether an expression contains a balanced parenthesis is? (CO2) 1

(a) Stack

(b) Queue

(c) Array

(d) Tree

1-e. In doubly 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. A variant of the linked list in which none of the node contains None is? (CO3) 1

(a) Singly linked list

(b) Circular linked list

(c) Doubly linked list

(d) None

1-g. Which of the following is not an advantage of trees? (CO4) 1

(a) Hierarchical structure

(b) Faster search

(c) Router algorithms

(d) Undo/Redo operations in a notepad

1-h. In which tree, for every node the height of its left subtree and right subtree differ atleast by one? (CO4) 1

(a) Binary search tree

(b) AVL tree

(c) Threaded binary tree

(d) Complete tree

1-i. For a given graph G having v vertices and e edges which is connected and has no cycles, which of the following statements is true? (CO5) 1

(a) v = e

(b) v = e+1

(c) v + 1 = e

(d) v = e-1

1-j. What is the maximum possible number of edges in a directed graph with no self loops having 8 vertices? (CO5) 1

(a) 28

(b) 64

(c) 256

(d) 56

2. Attempt all parts:-

2.a. Differentiate between primitive and non-primitive data types. (CO1) 2

2.b. The postfix form of A*B+C/D is? (CO2) 2

2.c. What are the advantage and disadvantage of doubly linked list? (CO3) 2

2.d. What is complete binary tree? (CO4) 2

2.e. Differentiate between Sequential and Indexed file organization? (CO5) 2

SECTION B 30

3. Answer any five of the following:-

3-a. Explain sparse matrix. What are the two ways to represent it. (CO1) 6

3-b. Write algorithm for Quick sort. Trace your algorithm on the following data to sort the given list 2, 12, 5, 21, 7, 55, 50, 87, 59, 1, 10. (CO1) 6

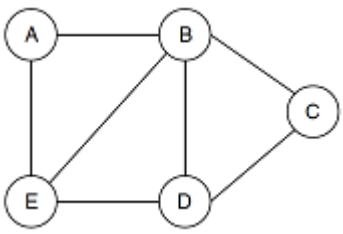
3-c. Explain the insertion mechanism in DEqueue. (CO2) 6

3-d. What is priority queue? Discuss its use. (CO2) 6

3.e. For doubly linked list write two functions: (CO3) 6
(i) to insert a node at the beginning and
(ii) to insert a node at the end

3.f. What is threaded binary tree? Explain two-way threaded binary tree with an example. (CO4) 6

3.g. Give (i) DFS and (ii) BFS traversal of the following graph. (CO5) 6



SECTION C 50

4. Answer any one of the following:-

4-a.	A hash table contains 11 buckets and uses linear probing to solve collision. The key values are integers and the hash function used is key%11. Draw the table that, results after inserting in the given order the following values:27, 8, 5, 20, 29, 11, 22, 38. (CO1)	10
4-b.	What is Bubble Sort? Write a python program for Bubble sort and find its complexity. (CO1)	10

5. Answer any one of the following:-

5-a.	Define recursion. Write a recursive and a non-recursive program to calculate the factorial of a given number. (CO2)	10
5-b.	Write an algorithm to convert an infix expression to its equivalent postfix expression. Trace your algorithm on : A-B/C+D*E+F. (CO2)	10

6. Answer any one of the following:-

6-a.	How can we represent a polynomial using a linked list? Write a function in Python to add two polynomials represented by linked list. (CO3)	10
6-b.	Write functions in Python to insert a node (i) at beginning, (ii) at the end in a doubly linked list. Illustrate with an example. (CO3)	10

7. Answer any one of the following:-

7-a.	What is AVL tree. Explain the term balance factor in AVL tree? Describe various rotations performed on AVL tree with the help of neat diagram. (CO4)	10
7-b.	Write a short note on: (CO4) i)B- Tree ii) Heap Tree iii)Extended Binary Tree iv) AVL Tree	10

8. Answer any one of the following:-

8-a.	Explain BFS with the help of a diagram? What is its worst case complexity? (CO5)	10
8-b.	Explain Dijkstra's Algorithm. Discuss its applications in real life. (CO5)	10