Printed Page:-   **Subject Code:-** ACSE0301

Roll. No:

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.*

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SECTION A   **20**

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1. Attempt all parts:-

1-a.   Time complexity of binary search is _____? (CO1)   1

        (a) O(n)

        (b) O(n^2)

        (c) O(n lgn)

        (d) O(lg n)

1-b.   What is the relation between Sparsity and Density of a matrix? (CO1)   1

        (a) Sparsity = 1 + Density

        (b) Sparsity = 1 – Density

        (c) Sparsity = Density*Total number of elements

        (d) Sparsity = Density/Total number of elements

1-c.   Process of inserting an element in stack is called _____ (CO2)   1

        (a) Create

        (b) Push

        (c) Evaluation

(d) Pop

1-d. Which data structure you mostly see in non recursive implementation of a recursive algorithm? (CO2)   1

    (a) Linked List

    (b) Stack

    (c) Queue

    (d) Tree

1-e. Consider an implementation of unsorted singly linked list. Suppose it has its representation with a head and tail pointer. Given the representation, which of the following operation can be implemented in O(1) time? (CO3)   1

I) Insertion at the front of the linked list
II) Insertion at the end of the linked list
III) Deletion of the front node of the linked list
IV) Deletion of the last node of the linked list

    (a) I and II

    (b) I and III

    (c) I,II and III

    (d) I,II and IV

1-f. Which code inserts a new node pointed by X to be inserted at beginning of a doubly linked list. (CO3)   1

    (a) X.prev = X.next
    X.next = X.prev

    (b) X.next = self.start
    self.start.prev = X
    self.start = X

    (c) X.prev = X.next
    X.next = X.prev
    self.start = X

    (d) X.prev.prev = X.next
    X.next.next = X.prev

1-g. What are the worst case and average case complexities of a binary search tree? (CO4)   1

    (a) O(n), O(n)

    (b) O(logn), O(logn)

(c) O(logn), O(n)

(d) O(n), O(logn)

1-h.   What is the maximum height of an AVL tree with p nodes? (CO4)   1

(a) p

(b) log(p)

(c) log(p/2)

(d) p/2

1-i.   Which of the following is false in the case of a spanning tree of a graph G?   1
(CO5)

(a) It is tree that spans G

(b) It is a subgraph of the G

(c) It includes every vertex of the G

(d) It can be either cyclic or acyclic

1-j.   Assuming value of every weight to be greater than 10, in which of the following   1
cases the shortest path of a directed weighted graph from 2 vertices u and v
will never change? (CO5)

(a) add all values by 10

(b) subtract 10 from all the values

(c) multiply all values by 10

(d) in both the cases of multiplying and adding by 10

2. Attempt all parts:-

2.a.   Define Sparse Matrix. (CO1)   2

2.b.   What is the use of Peek() in stack. (CO2)   2

2.c.   Write display method to print information of all nodes in a circular linked list.   2
(CO3)

2.d.   Define Depth of Tree. (CO4)   2

2.e.   Explain the need of files in data structures. (CO5)   2

SECTION B   **30**

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

3-a.   How binary search is different from linear search? Apply binary search to find   6
item 40 in the sorted list: 11, 22, 30, 33, 40, 44, 55, 60, 66, 77, 80, 88, 99. (CO1)

3-b.   Explain Row Major order Representation with example. (CO1)   6

3-c.   Write the algorithm for deletion in a circular queue (CO2)   6

3-d.	Write and explain deletion algorithm of stack. (CO2)	6
3.e.	Write a function to print alternate elements of a circular linked list. (CO3)	6
3.f.	Create an AVL Tree using 39, 56, 2, 9 87, 7, 23, 19 (CO4)	6
3.g.	Write an algorithm to count number of connected components in a graph. (CO5)	6

SECTION C 50

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

| 4-a. | Differentiate between Row-major and Column-major sparse matrix representation with example. (CO1) | 10 |
| 4-b. | Write an algorithm for bubble sort and write its worst case, average case and best case analysis. (CO1) | 10 |

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

| 5-a. | Write a python program to calculate factorial of a number using tail recursion. (CO2) | 10 |
| 5-b. | Write a Python Program to convert infix expression to postfix expression. (CO2) | 10 |

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

| 6-a. | A linked list in memory consists of numerical values. Write function in python for each of the following: (CO3)
 (i). Finding the maximum MAX of the values in LIST
 (ii). Finding the average MEAN of the values in LIST
 (iii). Finding the product PROD of the elements in LIST | 10 |
| 6-b. | With the Python program explain how the elements are inserted and deleted from a doubly linked list. (CO3) | 10 |

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

| 7-a. | Define B-Tree? Generate a B-Tree of order 4 with the alphabets (letters) arrive in the sequence as follows: a g f b k d h m j e s i r x c l n t u p (CO4) | 10 |
| 7-b. | The preorder traversal sequence of a binary search tree is-30 , 20 , 10 , 15 , 25 , 23 , 39 , 35 , 42. What is the postorder traversal sequence? (CO4) | 10 |

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

| 8-a. | Briefly explain Indexed sequential access file organization. What is the difference between read and write mode of a file? (CO5) | 10 |
| 8-b. | Discuss direct access file organization? List out the advantages and disadvantages of direct access file organization (CO5) | 10 |