Reg. No ..... Name **25U2045**

M.Sc. DEGREE END SEMESTER EXAMINATION - APRIL 2025

SEMESTER 2 : INTEGRATED M.Sc. PROGRAMME COMPUTER SCIENCE - DATA SCIENCE

COURSE : **21UP2CRMCP05 : DATA STRUCTURE USING C++**

(For Regular 2024 and Improvement / Supplementary 2023/2022/2021 Admissions)

Time : Three Hours Max. Weightage:: 30

PART A

Answer any 8 Questions

1. Define sparse matrices.
2. Recursion can be implemented using the data structure ----------.
3. The time complexity of linear search algorithm is _____.
4. The time complexity to search for a node in a linked list is _____.
5. Give two examples of notations that are used in defining the complexity of algorithms.
6. In _____ sorting algorithm, a pivot element is selected to partition the array.
7. Draw a diagram that represents a circular linked list containing 3 nodes.
8. Represent a singly-linked list containing three nodes by a diagram.
9. Define polish notation in writing arithmetic expressions.
10. State any one limitation of a normal queue implemented using an array.

(1 x 8 = 8 weight)

PART B

Answer any 6 (2 marks each)

11. Write an algorithm to check whether a list is a circular linked list or not?
12. Write the algorithm to remove an element from a queue.
13. Build a sorted heap from the following data:
    46, 25, 35, 49, 10, 92, 83, 32.
14. Memory for various program elements can be allocated during compile-time or at runtime. With an example, explain how both these methods differ.
15. Write an algorithm to delete a node at a given position from a linked list.
16. Suppose a stack `STK` is allocated N=6 memory cells and initially `STK` is empty (`TOP:=0`). Find the output of the following module:

```
1. Set PPP:= 2 and QQQ:=5.
2. Call PUSH(STK, PPP).
   Call PUSH(STK, 4).
   Call PUSH(STK, QQQ + 2).
   Call PUSH(STK, 9).
   Call PUSH(STK, PPP + QQQ).
3. Repeat while TOP = 0:
        Call POP(STK, DATA).
        Write: DATA.
4. Return.
```

17. Write an algorithm that finds the value of a postfix expression.
18. Write the algorithm that deletes an element at a particular location in an array.

(2 x 6 = 12 Weight)

PART C
Answer any 2 (5 marks each)

19. Write a C++ program to create a stack using an array. Demonstrate underflow and underflow situations.
20. With an algorithm to implement the procedure for bubble sort, write a program to perform the same on floating-point numbers. The numbers should be sorted in descending order.
21. Create a class QUEUE with the following specifications and implement the given functionality:
    Data Members: q[50], front, rear
    Member functions: create_queue() - to create a queue, dequeue() - to delete an element, traverse() - to display the queue.
22. Write a program using classes and objects to insert at a given position and traverse the linked list.

(5 x 2 = 10 Weight)