

END SEMESTER EXAMINATION : MARCH 2023**SEMESTER 2 : INTEGRATED M.Sc. PROGRAMME COMPUTER SCIENCE****COURSE : 21UP2CRMCP05: DATA STRUCTURE USING C++**

(For Regular - 2022 Admission and Improvement / Supplementary - 2021 Admission)

Time : Three Hours

Max. Weightage: 30**PART A****Answer Any 8 Questions**

1. Name the operator that is prefixed before a variable to indicate that it is a pointer variable.
2. Write the formula to determine the length of an array.
3. The worst-case time complexity of insertion sort is -----.
4. With respect to time and space, define the complexity of a merge sort algorithm.
5. Recursion can be implemented using the data structure -----.
6. Define a circular queue.
7. Define the data structure - priority queue.
8. The NEXT / LINK part of a node in a linked list contains -----.
9. Draw a diagram that represents a circular linked list containing three nodes.
10. List any two applications of a linked list.

(1 x 8 = 8 Weight)**PART B****Answer Any 6 Questions**

11. Write the algorithm to calculate the factorial of a number using recursion.
12. Given an array `arr[1..10][1..15]` with base address 100 and the size of each element is 1 B in memory, find the address of `arr[8][6]` implemented in row-major order.
13. Build a sorted heap from the following data:
46, 25, 35, 49, 10, 92, 83, 32.
14. Define Dequeue. Explain its classifications.
15. 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.
16. Write the postfix form of the expression : $A + ((B + C) + (D + E) * F) / G$

17. Correct the following module to make the program count the number of nodes in a list:

```
count_nodes() {
    int count=0;
    if(start == NULL)
        cout <<"List is Empty";
    else{
        node *ptr = start->next;
        while(ptr->next != NULL) {
            ptr = ptr->next;
            count ++;
        }
    }
}
```

18. Write a sample code snippet to create a new node of a linked list using class in C++.

(2 x 6 = 12 Weight)

PART C

Answer Any 2 Questions

19. With an algorithm, write a C++ program to sort a list of numbers using insertion sort.
20. Using conversion algorithm, convert the following expression into postfix expression:
 $A + (B * C - (D / E ^ F) * G) * H$
21. Convert the expression: $A + (B * C - (D / E - F) * G) * H$ into postfix form showing the stack status after scanning each symbol.
22. Write a program in C++ to implement queue using linked list and perform the queue operations.

(5 x 2 = 10 Weight)