[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 1571   F-3   Your Roll No................

Unique Paper Code   : 2511302

Name of the Course   : **B.Tech (Electronics)**

Name of the Paper   : C⁺⁺ & Data Structures

Semester   : III

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Question number **1** is compulsory.

3. Attempt any **4** from the remaining.

4. **All questions carry equal marks.**

5. Write answers of all parts of a question at one place only.

1. Attempt **all** parts of this question.

    (a) What are main features of a structured programming language ? Briefly spell out the reasons to migrate from structured paradigm to object oriented paradigm.

    (b) Find out the errors (if any) in the following program code

    ```
    #include<iostream.h>
    void main(){
    int arr[] = {2,4,6,8,10,12};
    int *ptrl, *ptr2;
    ptrl = arr;
    ptr2 = arr+10;
    ptrl = ptr2*3;
    }
    ```

(c) Explain the notion of try and catch blocks to implement exception handling in C++.

(d) Circular Queue is better than the Linear Queue. Justify the statement.

(e) Compute the number of nodes in a Complete Binary Tree of height 'h'.

<div align="right">(3×5=15)</div>

2. (a) What is the difference between call by value and call by reference mechanism in C++ ? Explain by giving a suitable example.

(b) Define a class that accepts as input the employee details such as name, age, emp id, address and basic salary. Write a program which implements a function that calculates the gross salary. The gross salary is calculated by adding basic salary to DA (20% of basic salary) and HRA (30% of the basic salary). The gross salary is finally displayed by implementing a function to display the employee details.

(c) Write a function template "min" to determine the smaller of the two arguments. Write a program that uses the above template to find minimum of two integers and two floating point numbers.   (5×3=15)

3. (a) Explain operator overloading in C++. Write rules to implement overloading of a binary operator. Give a generic syntax for the same.

(b) Discuss hybrid inheritance and its implementation in C++. What do you understand by a virtual base class? What are its advantages ?

(c) What is run time polymorphism ? Explain concept of pointer to an object in this context by giving a suitable example.   (5×3=15)

4. (a) Write an algorithm to delete an element from the beginning of a given doubly linked list.

(b) Convert using stack the following infix expression to its equivalent postfix expression.

$$(A-B) / ((D+E) * F)$$

(c) Give the output of the following program

```
#include <iostream.h>
int main () {
int p[5];
short q[5];
cout « &p[0] « ' ' << &p[1] << "\n";
cout « &q[0] « ' ' << &q[1] << "\n";
}
```
(5×3=15)

5. (a) What is a priority queue? How is it implemented ?

(b) Explain the various operations of a QUEUE data structure.

(c) Apply Merge sort to the following list. Show all the steps.

15, 47, 23, 12, 2, 10, 50, 33, 98, 59   (5×3=15)

6. (a) Apply divide and conquer strategy to search a given element in a BST obtained from the given list

10, 2, 16, 7, 25, 19, 12, 35, 30, 15, 9, 13, 6, 4, 42

(b) What are Heap trees ? Discuss the difference between a Min Heap and a Max Heap. Explain with an example.

(c) Write a function in C++ to find the height of a binary tree.   (5×3=15)

7.   Write short notes on any **two** :

(a)   Compile Time Polymorphism

(b)   Sparse Matrices

(c)   A degenerated Binary Search Tree   (7.5+7.5=15)