

Sl. No. : 6120

Unique Paper Code: 2511302

Paper : C++ and Data Structures

Course : B. Tech (Electronics)

Semester - III

F-5

Duration: 3 Hours

Max. Marks: 75

Question number 1 is compulsory. Attempt any four from the remaining six. All questions carry equal marks. Write answers of all parts of a question at one place only.

Q 1. Attempt all parts of this question.

- a) Briefly explain data abstraction and abstract data type (ADT) with reference to a class.
- b) State the difference between the following two statements.
`int arr[10];`
`int *arr = new int[10];`
- c) How is exceptional handling implemented in C++?
- d) Give three applications of queues.
- e) A given binary search tree is to be sorted. Which traversal method is preferred?

(3x5=15)

Q2. a) What is the purpose of scope resolution operator? Discuss the concept in the context of local and global variables with the help of an example.

b) Write a program in C++ that accepts from user the data pertaining to n students for three subjects containing name, roll no, marks, course name. The program should calculate the final marks of the students and display the student details.

c) Write a C++ function template to multiply two arguments. Use this template in the program to multiply two integers and two floating point numbers.

(5x3=15)

Q3. a) What is copy constructor in C++? Explain in how many ways it can be implemented.

b) Draw a class hierarchy in which several classes are derived from a single base class. Distinguish between single level and multilevel inheritance.

c) Explain the concept of this pointer and write its brief implementation.

(5x3=15)

Q4. a) Give the output of the following program

`#include <iostream.h>`

In the help of an example.

```

int main () {
    int vi [10];
    short vs[5];
    cout << &vi[0] << " " << &vi[1] << "\n";
    cout << &vs[0] << " " << &vs[1] << "\n";
}

```

- b) Write an algorithm to insert an element into a given single linked list at an arbitrary position.
- c) Evaluate the following infix expression using stack. The values of P, Q, R, S and T are respectively 30, 12, 5, 9 and 15.

$$(P-Q) / ((R+S) * T)$$

(5x3=15)

- Q5. a) Define a queue. Give an implementation of a circular queue using arrays.
- b) Given a sorted list of n=10 elements. Show by using a suitable example that binary search is better than the linear search in terms of number of comparisons.
- c) Sort the following list using Quick Sort. Show all the steps.

88, 5, 10, 25, 7, 16, 11

(5x3=15)

- Q6. a) Give two main differences between a Binary Search Tree (BST) and a Binary Tree. Construct a BST from the given list of integers

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

- b) Apply pre-order and post-order traversal to the tree obtained in part (a).
- c) Apply the notion of height balancing to the BST obtained in part (a) and thus generate an AVL tree out of it.

(5x3=15)

- Q7. Write short notes on any two of the following

- a) Polymorphism
- b) Polynomial Addition using a Linked List
- c) Heap Sort Algorithm

(7.5 + 7.5 =15)