Please check that this question paper contains 9 questions and 3 printed pages within first ten minutes.

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Uni. Roll No. .....

Program: B.Tech. (Batch 2024 onwards)
Semester: 1
Name of Subject: Programming for Problem Solving
Subject Code: ESC103
Paper ID: 17802
Scientific calculator is Not Allowed

Time Allowed: 03 Hours **Max. Marks: 60**

NOTE:

1) Parts A and B are compulsory
2) Part C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
3) Any missing data may be assumed appropriately. For programs, it is expected that suitable assumptions are made and stated wherever micro-level requirement related to the code to be developed is not mentioned.

Part – A **[Marks: 02 each]**

Q1

a) While it is observed that compiled code typically executes faster than interpreted code, analyze and explain four other significant differences between a compiler and an interpreter

b) Can multiple arrays of the same or different data types be declared in a single declaration statement? Justify your answer with an example.

c) State the role of **typedef** with example.

d) "Short-circuiting is where an expression is stopped being evaluated as soon as its outcome is determined." Justify the quoted statement with example(s).

e) Why do programmers make use of functions?

f) What will be the output of following code?

```
#include <iostream>
using namespace std;
int main() { int x = 0, y = 0;  while (++x < 3) {  y = 0;
    while (++y < 3) {  if (x == 2 && y == 2) {  continue; }
      cout << x << ", " << y << endl;
      if (x == 4 || y == 3) { break; } } }
  cout << x << " " << y << endl; return 0; }
```

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Part – B **[Marks: 04 each]**

Q2 Differentiate between structures and unions. [Program(s) are also expected.]

Q3 What all things happen at the backend when a program has to be executed? Illustrate your answer with a diagram.

Q4 With the help of scenario justify how implicit and explicit type conversions take place.

Q5 Differentiate between call by value and call by reference. [Program(s) are also expected.]

Q6 Construct a flowchart and write an algorithm to swap two positive numbers using bitwise operators without using a temporary variable.

Q7 Develop a recursive function to compute the multiplication of elements in a one-dimensional integer array

Part – C **[Marks: 12 each]**

Q8 Explain various components of computer system with the help of a block diagram. Also discuss various types of software and translators other than compiler and linker.

OR

Discuss in detail various naming convention of variables and various data types (including range, size in bytes, examples etc.)

Q9 You are the HR manager of a company, and you are using **employee management system** to manage the employee data. The system allows you to add new employees, display all employees, search for an employee by ID, update employee salary, and delete an employee.

Create a struct employee with

Attributes:

Name : String ID : Integer Department : String Salary : Double

Functions:

- addEmployee ( ) : Adds the employee to the directory
- displayEmployees ( ) : Displays all the employees present in directory
- searchEmployee ( ) : Search for the employee with Emp ID
- updateEmployeeSalary ( ) : Updates the salary of employee with Emp ID
- deleteEmployee ( ) : Deletes the employee from the directory with Emp ID

Conditions:

For every addition of new employee, print a message as "Employee added successfully!"
If there are no employees left in the directory, print "No employees to display"
If Employee not found print "Employee not found"

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You are managing an **Inventory Management System** for a store. The system allows you to add new items, display all items, search for an item by ID, update item quantity, and delete an item.

Create a struct Item with:

- **Attributes:**
  - Name: String
  - ItemID: Integer
  - Category: String
  - Quantity: Integer
- **Functions:**
  - addItem(): Adds a new item to the inventory.
  - displayItems(): Displays all items in the inventory.
  - searchItem(): Searches for an item using its Item ID.
  - updateItemQuantity(): Updates the quantity of an item using its Item ID.
  - deleteItem(): Deletes an item from the inventory using its Item ID.

Conditions:

- Print "Item added successfully!" for every new addition.
- Print "No items in inventory" if the inventory is empty.
- Print "Item not found" if the Item ID does not exist.

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