


VIT

Vellore Institute of Technology

Course: ICSE102L

Class NBR(s): 4143/ 4150/4154/4159/4163

Time: Three Hours

Final Assessment Test - April 2025

Reg. No: 24MI30075

Structured and Object Oriented Programming

Slot: F1

Max. Marks: 100

 KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
 DON'T WRITE ANYTHING ON THE QUESTION PAPER

 Answer ALL Questions
 (10 X 10 = 100 Marks)

1. Write a C program to simulate a real-time elevator system using do-while loop and switch statements. The program should take the following inputs from the user:
 Current floor of the elevator (assumed to be always the Ground Floor (0)).
 User's current floor (an integer between 0 (Ground Floor) and 12).
 User's destination floor (an integer between 0 (Ground Floor) and 12).
 Based on these inputs, the program should simulate the elevator's movement and display appropriate messages:

- Validate the user input: Ensure the entered floor values are within the valid range (0 to 12).
- Display the movement of the elevator from the Ground Floor (0) to the user's current floor, printing all intermediate floors.
- Display a welcome message when the elevator reaches the user's floor, indicating that they can board.
- Show the elevator's movement from the user's current floor to their destination floor, printing all intermediate floors.
- Display a final message upon reaching the destination:
 "Reached Floor X. Have a nice time!" (where X is the user's destination floor).

2. Write a C program to determine the Union and Intersection of two sets that are available in two one-dimensional numerical arrays and the results display. In this case, the set of all elements that are either in A or in B is called the Union of two sets A and B, while the set of all elements that are common is called the Intersection of two sets A and B.

3. Rakshan aims to create a program to determine the total ticket cost for an upcoming event, considering his age and the quantity of tickets he intends to buy. The available ticket types are Basic (Rs. 200.0) and VIP (Rs. 350.0), each priced differently. The program should apply age-based discounts and utilize pointer arithmetic for price calculations. If Rakshan's age is less than 18, he will receive a 15% discount on Basic tickets. If Rakshan's age is 18 or older, he will receive a 7% discount on VIP tickets. To calculate total cost use the following formula total cost = discounted price * number of tickets, where discounted price = original price - (original price * discount percentage).

4. Create a structure called employee that holds information like employee ID and name. Create another structure called address which holds information like Door_Number, Street_Name, City and Postcode. Declare the address structure inside the Employee structure. Develop a C program to input basic salary of 50 employees and calculate their gross salary according to the given conditions. Print the complete employees information and Gross salary [addition of DA, HRA and basic salary] up to two decimal places.

DA and HRA calculation is given below:

$$DA = \text{basic_salary} * (DA/100)$$

$$\text{HRA} = \text{basic_salary} * (\text{HRA}/100)$$

Given the following HRA and DA percentages:

Basic Salary $\leq$ 10000 : HRA = 20%, DA = 80%

Basic Salary between 10001 to 20000 : HRA = 25%, DA = 90%

Basic Salary $\geq$ 20001 : HRA = 30%, DA = 95%

5. Develop a C++ program to create a class "Book" and with the data members "Book_No", "Book_Name", "Book_Price" and member function "Total_Cost()" that calculates the cost of "N" books where "N" is passed as an argument. Other Member Functions of the class "Book" are "Input ()" function to read "Book_No", "Book_Name", "Book_Price", "Purchase ()" to get an input for the number of copies to be purchased. It uses "Total_Cost ()" function call to calculate the cost of "N" books and prints the "total cost" to be paid by the user and "Show_Info" to display entered book details and purchased details. Create the required object() for this class and make the program works effectively.
6. Raj, a recent graduate, is excited about buying his first car and considering a loan. To calculate the total interest paid, he wants to design a class using multiple inheritance. Create a class named Loan inheriting from the classes: Principal and InterestRate. Write a program which calculates the total interest (Total Interest = price * interest rate * years) paid over the loan period, aiding Raj in understanding the financial implications. Principal class - stores the price as a protected attribute
InterestRate class - stores interest rate as a protected attribute
Loan class - calculates total interest
7. Build a C++ program to multiply two objects using binary multiplication (*) operator overloading in which each object has two different values. Create a class "Multiply" in which the class contains data members as "first" and "second" and member functions are
 - "getNum(int, int)" – to get input value
 - "dispNum()" – to print result
 - "operator*(Multiply)" – to perform the multiplication operation
8. Create a function "swap" using templates; your function can be "void swap (t x, t y)". This function should display the swapped values out of the two values being passed. In your main function, create variables of different types as integer, character and check what your function returns for each variable type.
- 9.a) Elucidate the different storage classes in C with examples.
OR
- 9.b) List various functions provided by C language to facilitate dynamic memory allocation and explain each in detail with examples.
- 10.a) Define Polymorphism. Differentiate function overloading and operator overloading with your own illustrations.
OR
- 10.b) Describe the features of Object Oriented Programming with proper real-time scenarios as illustrations.