X/D/TY

Reg. No: 24BCE0463

VIT
Vellore Institute of Technology

Final Assessment Test – April 2025

Course: BCSE102L - Structured and Object-Oriented Programming

Class NBR(s): 1463/1473/1483/1487/1502/1508/1524/ 1557/1568/1583/1591/1598 Slot: B2

Time: Three Hours 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. i. A program should keep asking the user to enter a positive number. If the user enters a negative number, the program should ask again. Kindly ensures the user is prompted at least once. Which loop is best suited for this? Write a C program with proper output. [3]

   ii. Write a C program for print the numbers from 1 to 10 but skip number 8. [3]

   iii. Traffic police want to set up different lights to create the perfect traffic rules. He has three types of light modes available: red, green, yellow lights. Each light mode has a different speed adjustment factor. [4]

   Conditions for speed adjustment:

   Initially the common speed level is 25.

   For red light (Mode 1): The speed level is multiplied by 0.

   For green light (Mode 2): The speed level is multiplied by 2.8.

   For yellow light (Mode 3): The speed level is multiplied by 1.8.

   Write a C program to adjust the speed of the lights based on the selected mode.

2. Write C program for following scenarios:

   i. In a class, the teacher asks the students to calculate the sum of each row in a 3x3 matrix.

   ii. A form validation system needs to check if a user's password is the same as the confirmed password after copying.

3. In placement cell, the officer wants to assign the placements for the students based on the below mentioned conditions. Write a C program using function that takes a student's marks as input and returns their eligibility for placements based on the following conditions:

   95 - 100 → Google

   85 - 96 → Microsoft

   75 - 86 → TCS

   55 - 76 → Oracle

   45 - 56 → Zoho

   Marks < 45 → not eligible for placements and suggested for Improvement.

4. a) Write a C program to demonstrate the difference between malloc() and calloc() by allocating memory for an integer array using both functions. [7]

b) write a C program using pointers that reads an integer n (input must be greater than 10000) and finds the sum of its maximum and minimum digits present in n. [3]

5. A company needs to maintain an employee payroll system storing Employee ID, Name, Salary, and Department. Write a C program that uses the structure to store 'N' employee's details. Also use CalculateIncrement() function to increment the salary of the employees based on the below criteria and display the complete employee's information along with the updated salary.

Salary	Increment (%)
<=10000	5
10001<=25000	10
25001<=50000	15
50001<=75000	20
75001<=10000	23
>10000	25

6. i. You are requested to designing a Library Management System that stores a Book Name, Author name, Book Number, and Price. [7]
   - How would you design a class for this system?
   - How would you create and initialize an object for this class?

   ii. Write a program, how does an inline function differ from a normal function? [3]

7. a) Write a C++ program that calculates the total calories burned during different types of games. It includes two types of games: Cricket and football. These games are organized in a hierarchy of classes. The **Games** class serves as the base class, and the specific game types are derived from it.

The **Games** class has two protected member variables: duration and weight. It also contains a constructor that initializes these variables and a function calculateCaloriesBurned(), to calculate the calories burned.

The derived classes in the hierarchy are as follows:

Cricket class: This class represents a cricket game. It inherits from the Games class and has an additional private member variable called intensity. The Cricket class implements the CricketcalculateCaloriesBurned() function to calculate the total calories burned during the cricket game based on the duration, weight, and intensity of the exercise.

Football class: This class represents a football game. It also inherits from the Games class and has an additional private member variable called repetitions. The Football class implements the FootballcalculateCaloriesBurned() function to calculate the total calories burned during the Football game based on the duration, weight, and number of repetitions.

Note: The formula for calculating calories burned in Cricket game is:

caloriesPerMinute = 8 * intensity * weight / 200

totalCaloriesBurned = caloriesPerMinute * duration

The formula for calculating calories burned in football game is:

caloriesPerRep = 5 * weight / 100

totalCaloriesBurned = caloriesPerRep * repetitions * duration.

OR

7.b) AARA ordered some foods in an online food delivery platform. The hotel manager decided to give some discounts for AARA. The hotel manager needs a program to calculate order costs with discount options for AARA. Write a C++ program that uses multi-level inheritance for the below.

i. class **Order** - Holds item, price, quantity, and discount as attributes.
ii. class **FinalOrder** - Derived from Order class which calculates the total cost for AARA with a given item, price, quantity, and discount percentage.
iii. class **DiscountedOrder** - Derived from FinalOrder class which calculates the final cost for AARA, considering an additional discount on top of the regular discount.

Total Cost = (Item Price × Quantity) - (Item Price × Quantity × Discount / 100.0)
Final Cost = (Total Cost) - (Total Cost × Additional Discount / 100.0).

8.a) Write a C++ program for developing a Counter class by increment and decrement.

- How would you overload the ++ operator for both **prefix** and **postfix** increments?
- How would you overload the -- operator for both **prefix** and **postfix** decrements?

OR

8. b) Write a C++ program to calculate the area of different shapes using function overloading where calculateArea() works for different shapes based on input parameters.

i. Circle → Takes radius as input.
ii. Rectangle → Takes length and breadth as input.
iii. Triangle → Takes base and height as input.

9. Raihan needs to create a program for a ticket reservation system. The program that uses the base class **Reservation** with the virtual function **calculate()**, which will be overridden in the derived classes **VIP** and **Standard**.

VIP reservations receive age-based discounts:

15% for ages 5–15.
13% for ages 16–25.
10% for ages 26–60.
Standard reservations receive age-based discounts:
16% for ages 5–15.
10% for ages 16–25.
5% for ages 26–60.

Write a C++ program that takes input for VIP and standard ticket prices, along with the number of each reservation and the age of the customers. Calculate and display the total prices for both VIP and standard reservations.

10. Illustrate the Function Template and Class Template with an example.

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