

**VIT**

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

Continuous Assessment Test- II March 2025

Programme	M.Tech Integrated - Business Analytics, Software Engineering	Semester	Winter Semester 2024-2025
Course	Structured and Object Oriented Programming	Code	ICSE102L
		Class ID	CH2024250502337, CH2024250502377, CH2024250502375
Faculty	Dr. Mansoor Hussain D, Dr. Vivekanandan M, Dr. Nathezhtha	Slot(s)	C1
Time	90 Minutes	Max. Marks	50

Answer ALL the Questions

1. A defence organization manages a DRONE fleet, where each drone has a model name (max 25 chars), a serial number (int), and flight endurance (float, max hours of operation). In main function, dynamically allocate memory for an array of DRONE structures, read n, input n drone details, and efficiently call the required functions. Implement a system using an array of structure to: [15]
- Search for a drone by model name and return the associated details, or display "Does not exist" if not found. (2.5 Marks)
- Search for a drone by serial number and return the associated details, or display "Does not exist" if not found. (2.5 Marks)
- Display all drones with flight endurance above a given threshold x. (5 Marks)
- Compute and display the highest flight endurance and the average flight endurance of all drones in the fleet. (5 Marks)
2. You have joined navigation and mapping company, enhancing Google Street View analytics with spatial computations. Your team is developing a tool to optimize camera placements, route distances, and coverage areas. [10]
- Your task is to implement a C++ program that processes locations as points in a 2D Cartesian plane. Create a class the coordinates x, y will be the members of class and member functions should performs the following:
- Compute Euclidean distance between two locations to determine optimal Street View capture spacing. The Euclidean distance d between two points (x₁,y₁) and (x₂,y₂) is calculated as follows (4 Marks)

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Compute the midpoint between two locations for even image distribution along routes. The midpoint (M_x,M_y) is given by $M_x = (x_1 + x_2)/2$ and $M_y = (y_1 + y_2)/2$. (2 Marks)

Compute the area of a triangle formed by three locations to assess street coverage and the need for additional cameras. Given three points, (x_1, y_1) , (x_2, y_2) and (x_3, y_3) , the area A is computed as (4 Marks)

$$A = \frac{1}{2} |x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|$$

The program should get three coordinate sets as input, execute calculations sequentially, and present a summary for Street View optimization, improving coverage and efficiency.

3. Develop a railway reservation system that efficiently manages passenger information, seat availability, and ticket bookings for multiple trains. Every time a passenger books a ticket, the system should capture the passenger's name, train number, and the number of seats booked. It should then display a confirmation message with the passenger's details and allocated seat information based on availability. [10]

The system should have a class with private members to store passenger details, including name, train number, and seats booked. A **Book_tickets** function inside the class should handle ticket bookings by verifying seat availability, allocating seats, and updating records (4 Marks). Another function **Cancel_tickets** within the class should manage ticket cancellations by confirming the cancellation and releasing the allocated seats (3 Marks).

Additionally, implement a **Display** function that does not belong to the class but is capable of accessing and displaying passenger booking details (3 Marks). The system should support multiple reservations using an array of objects to ensure efficient booking and cancellation management across different trains.

4. As an engineering student, you are required to design a Student Record Management System demonstrating hybrid inheritance based on a given class hierarchy. The system should use protected mode of inheritance for child classes and should calculate and display grades for undergraduate students (7 Marks) while determining the result status for postgraduate students (6 marks) based on the given criteria. [15]

Base Classes:

Person – Stores student attributes such as name and ID.

Score – Holds the student's score. (Subject Marks)

Derived Classes:

Undergraduate Student – Inherits from both Person and Score, calculates the grade based on the given score using the criteria below:

90 or above → Grade 'A'

80 to 89 → Grade 'B'

70 to 79 → Grade 'C'

60 to 69 → Grade 'D'

Below 60 → Grade 'F'

Postgraduate Student – Inherits from both Person and Score, determines the result (Pass/Fail) based on the given score:

60 or above → Result 'Pass'

Below 60 → Result 'Fail'

ii) Identify the different types of inheritance used in the above scenario and describe the impact of changing the mode of inheritance for child classes to private. (2 Marks)