

OOP Assignment # 1

Question 1:

You are developing an inventory management system for a futuristic space station. Each inventory item has a unique ID, a name, a quantity, and a category (e.g., Food, Tools, Equipment).

Requirements:

➤ **Item Representation:**

- Each item in the inventory has the following attributes:
- Item ID: A unique identifier (integer).
- Item Name: A descriptive name (string).
- Quantity: The number of items available (integer).
- Category: The type of item (e.g., Food, Tools, Equipment).

➤ **Functionality:**

- The system should allow adding new items, updating quantities, and retrieving item details.
- Retrieval requests can be based on item ID or category.
- The system should display the total count of items in each category.

➤ **Constraints:**

- The inventory system will handle a large number of items.
- Performance and memory efficiency are critical.

Should you use a struct or a class to represent these items? Justify your choice and implement your solution in C++.

Question 2:

Imagine you're developing a complex simulation software for a robotics research lab. The software needs to model various types of robots with different capabilities. Each robot has the following characteristics:

- Unique ID
- Type (e.g., industrial, humanoid, aerial)
- Power Source (e.g., battery, solar, fuel)
- Maximum Speed (in meters per second)
- Weight (in kilograms)

Design a C++ program to implement this simulation. You should create a class called `Robot` to represent a robot, incorporating the following:

- A parameterized constructor to initialize the attributes of the robot.
- A destructor to handle resource deallocation.
- Implement both shallow copy and deep copy mechanisms within the `Robot` class.

Write a C++ program that demonstrates the functionality of the Robot class you've designed. Your program should:

- Create an array of Robot objects, each initialized with unique attributes using the parameterized constructor.
- Implement a function to perform a deep copy of the array/vector of Robot objects.
- Implement a function to perform a shallow copy of the array/vector of Robot objects.
- Display the details of each robot before and after the copy operations to demonstrate the differences between shallow and deep copy.

Question 3:

You are designing a fleet management system for an autonomous vehicle company. The company operates a fleet of self-driving cars with different specifications and capabilities. Design a C++ program to model the vehicle fleet, creating a class called AutonomousVehicle to represent each vehicle. Implement a parameterized constructor to initialize the vehicle's attributes, including its unique ID, type (e.g., sedan, SUV), battery capacity, and maximum speed. Ensure that your implementation supports both shallow and deep copy mechanisms for managing the fleet's data. Use protected access specifier to inherit properties of parent class to 2 child classes, which act as parent for another class. E.g if child is A and B, then A and B should become parents for their child C.

STRICTLY ACTION AGAINST PLAGIARISED ASSIGNMENT

Submission in soft form is enough, submit ms word doc & code files in a folder renamed as your roll no.