### **Coding Skills Assessment**

#### **Instructions:**

* You are required to complete three parts of this assignment: **System Design**, **Business Logic Implementation**, and **Database Query Writing**.
* You may use any programming language and database management system you are comfortable with.
* Ensure that your code is modular, scalable, and follows clean coding practices.

### **Part 1: System Design**

**Problem Statement:**Design a simplified **e-commerce system** that handles users, products, orders, and payments.

#### **Requirements:**

* The system should support multiple users with the ability to create, view, and manage orders.
* Each order can contain multiple products.
* A payment can be made for each order, and an order can have different statuses (e.g., pending, completed, shipped).

#### **Deliverables:**

1. **Class Diagram** that outlines the relationships between User, Product, Order, and Payment.
2. Write code stubs for each of the main components, ensuring that relationships (e.g., Order contains multiple Products) are appropriately handled.

### **Part 2: Business Logic Implementation**

**Problem Statement:**You are tasked with implementing an **inventory management system** for a warehouse. The system should be able to track stock levels and manage restocking.

#### **Requirements:**

1. Implement a function that:
   * Takes a list of products with their current stock levels and a list of incoming sales orders.
   * Reduces the stock levels based on the orders.
   * If the stock level of any product drops below a certain threshold (e.g., 10 units), an alert should be triggered to restock the item.
2. Implement a function to **restock** items. The function should:
   * Take a list of products that need restocking and their required quantities.
   * Update the stock levels accordingly.

#### **Deliverables:**

* Provide the code implementation for the two functions: process\_orders() and restock\_items().
* Ensure error handling is in place for invalid input (e.g., trying to process an order when the product is out of stock).

### **Part 3: Database Query Handling**

**Problem Statement:**You are given a relational database schema for an online bookstore with the following tables:

**Tables:**

Customers (customer\_id, name, email)  
Books (book\_id, title, author, price)  
Orders (order\_id, customer\_id, order\_date)  
OrderDetails (order\_id, book\_id, quantity)

#### **Requirements:**

1. Write a SQL query to retrieve the top 5 customers who have purchased the most books (by total quantity) over the last year.
2. Write a SQL query to calculate the total revenue generated from book sales by each author.
3. Write a SQL query to retrieve all books that have been ordered more than 10 times, along with the total quantity ordered for each book.

#### **Deliverables:**

* Provide the SQL queries for the three requirements.
* Ensure that the queries are optimized for performance, considering indexing where necessary.

### **Submission Guidelines:**

* Submit your code and any necessary files (diagrams, database scripts) in a single archive.
* Include a **README** explaining your solution, how to run it, and any assumptions you have made.

#### **Evaluation Criteria:**

* **System Design**: Clarity, scalability, and correctness of the design.
* **Business Logic**: Efficiency, correctness, and robustness of the logic.
* **Database Query**: Correctness, performance, and understanding of SQL.
* **Clean Code**: Adherence to coding best practices, readability, and maintainability.