Lab 05 Tasks

Task 01

A car rental company needs to manage its fleet of cars. Each car has a unique registration number, a model name, and an owner name. When a new owner rents the same car, a copy of the original car should be made, transferring all its details except the owner name, which should be updated.

Your task is to develop a system where:

- A Car class stores details of a car, including registration number, model, and owner name.
- A copy constructor should be implemented.
- The system should allow displaying car details.

Develop a program that creates multiple cars, makes a copy when a new owner rents the same car, and displays the details.

Task 02

A medical lab maintains patient records where each patient has a unique ID, name, and a dynamically allocated array storing their recent test results. When a patient's record is duplicated for analysis, a **copy** must be made so that the test results remain independent between copies.

Your task is to develop a system where:

- A Patient class stores details including an ID, name, and an array of test results.
- A copy constructor should be implemented.
- A function should allow displaying patient details, including their test results.

Develop a program that creates patient records, makes a copy of a patient for further analysis, and displays their details.

Task 03

FAST University is looking to maintain records of its professors, who each belong to different departments such as Computer Science, AI & DS, and S.E. The university administration needs a system where it can add professors dynamically and retrieve their details. However, professors often conduct research outside the university.

Your task is to develop a system where:

- The university can store and manage multiple professors dynamically.
- Professors should have a name and department stored separately.
- A function should allow displaying the university details, including a list of professors working there.
- Design the University and Professor classes, ensuring the correct relationship between them.

Task 04

A smartphone company is designing a new model where each phone comes pre-installed with a non-removable battery. The battery is an essential component. Every battery has a specific capacity (mAh), and each smartphone model must have its battery initialized at the time of creation.

Your task is to develop a system where:

- Each smartphone must have a battery when it is created.
- A function should allow displaying both the smartphone details and its battery specifications.
- The battery should not exist separately from the smartphone.
- Design the Smartphone and Battery classes, ensuring the correct relationship between them.

Task 05

A travel agency manages multiple tour guides. Each tour guide works independently and can be assigned to different travel agencies without belonging to any single one permanently. The system should allow assigning guides dynamically to an agency.

Your task is to develop a system where:

- A TourGuide class stores details such as name, years of experience, and specialization.
- A TravelAgency class contains a list of tour guides it hires.
- The TravelAgency class should have a function to display details of the agency and the tour guides currently associated with it.

Develop a program that creates multiple tour guides, assigns them to a travel agency dynamically, and displays the details.

Task 06

A cinema hall maintains a record of the movies being screened. Each movie has a title, director, and duration, and must be permanently associated with a cinema hall. A movie **cannot exist independently** outside a cinema hall.

Your task is to develop a system where:

- A Movie class stores details such as title, director, and duration.
- A CinemaHall class contains a list of movies currently being screened.
- A function should allow displaying details of the cinema hall and the movies it is screening.

Develop a program that initializes a cinema hall with its movies, ensures movies cannot exist without a cinema hall, and displays their details.

Task 07

A department store wants to automate its inventory system to keep track of its products, which include electronics, clothing, and groceries. Each product has a unique ID, name, and price. The store manager needs a system where they can:

Store multiple products in an inventory.

- Sort the products in ascending order based on price to find the cheapest options.
- Search for a product by name and display its details if found.
- Develop a program that allows the store to efficiently manage products by entering product details, sorting them by price, and searching for specific products.