CS3201: OBJECT ORIENTED PROGRAMMING LABORATORY

***Topic*: Constructors and Destructors, Single Level**

Inheritance, Multi-level Inheritance and Operator Overloading

Date: 01/03/2025

SPOT QUESTIONS

Answer any three out of four questions:

1. Create a **Polynomial** class to represent polynomials with coefficients stored in a dynamic array. Implement the following:
   - Overload the **+ *operator*** to add two polynomials of the same degree.
   - Overload the **** operator*** to multiply two polynomials and return the resulting polynomial.
   - Overload the **<< *operator*** to display the polynomial in standard form.

   Ensure proper memory management using a copy constructor and destructor.
   Write a main function to demonstrate polynomial addition and multiplication.

2. Design a base class **Employee** with protected members name, *employeeID*, and *baseSalary*. Implement:
   - A constructor that initializes these attributes.
   - A virtual function *CalculateSalary()* that returns *baseSalary*.
   - A derived class Manager that adds bonus as a private member and overrides *CalculateSalary()* to include the bonus.
   - A derived class **SalesPerson** that adds commission and *salesAmount*, overriding *CalculateSalary()* to compute salary as "*baseSalary + (commission * salesAmount)*".

   A main function to create objects of both **Manager** and **SalesPerson** and display their salaries using a base class pointer.

3. Implement a **University System** using multilevel inheritance:
   - Base class **Person** with attributes *name*, *age*, and *address*.
   - Derived class **Faculty** that extends *Person*, adding *employeeID, department, years of experience* and *designation.*
   - Further derived class **Professor** that extends **Faculty**, adding *publications, coursesTaught*, and a function *PromoteProfessor()* which determines promotion eligibility based on years of experience and publications.

Promotion Criteria:

A professor is eligible for promotion if they meet **both** of the following conditions:

- **Years of Experience:** Must have at least **10 years** of teaching/research experience.
- **Publications:** Must have at least **15 research publications** in recognized journals/conferences.
- If a professor has **at least 8 years of experience and 20+ publications**, they may still qualify for early promotion through a special evaluation.

Write a ***main*** function to demonstrate the creation of a **Professor** object, display details, and determine if the professor is eligible for promotion.

4. Design a **Resource Management System** that simulates handling different types of system resources. Implement:
   i) A **base class SystemResource** that represents a generic resource with attributes *resourceID* and *allocatedSize*.
      (1) The constructor dynamically allocates memory to simulate resource allocation.
      (2) The destructor should release the allocated memory.
   ii) A **derived class FileHandler** that extends ***SystemResource*** and represents a file-based resource:
      (1) Adds an attribute *fileName*.
      (2) Implements a constructor that simulates opening a file.
      (3) Implements a destructor that ensures proper file closure before releasing memory.
   iii) A **further derived class NetworkSession** that extends ***FileHandler*** and represents an active network connection:
      (1) Adds attributes *sessionID* and *networkStatus*.
      (2) The constructor simulates opening a network session.
      (3) The destructor ensures the session is closed before the file is closed and memory is released.