CS1004 - Object-oriented Programming (OOP)
Assignment # 1
BS(CS)

Max Points: **50**

Due Date: **Sunday, March 06, 2022, 11:59 p.m.**

Carefully read the following instructions!

- It should be clear that your assignment would **not get any credit** if the assignment is submitted after the **due date**. **No** assignment will be **accepted after the due date**.
- Strict action will be taken if the submitted solution is copied from any other student.
- If you people find any mistake or confusion in the assignment (Question statement), please consult before the deadline. After the deadline no queries will be entertained in this regard.
- For any query, feel free to email at: **farah.sadia@nu.edu.pk**
- Submission: Submission will only be accepted through **GOOGLE CLASSROOM**.
- Submit all your codes with your Student ID and task number. **"K211234_Q1"**.
- Each output must contain your ID and name on the screen.
- Every code should be with proper **commenting**.
- Plagiarism is punishable with zero grades in the task.

Question # 01: *Short answers*

Describe following reasons:

1. Which Feature of OOP illustrated the code reusability? Explain with examples.
2. What is the difference between encapsulation and Abstraction? Explain with a real time example.

Question # 02: *Implement UML Diagram*

A scenario is shown in given UML diagram. Review it to write program for each of the following tasks:

a. Create classes with defined member variables and functions. Each class must have default and parameterized constructors that assigns initial values to all members and destructors.

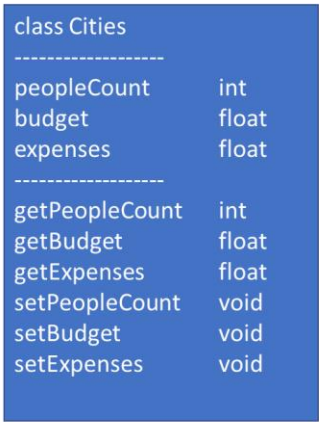
b. Write a main function where:
   i. Create one country "Pak" which should have five provinces.
   ii. One province has four cities.
   iii. Consider your ID as the total budget in millions for country "Pak", for example ID is "k21-1234", so 1234 million budget.
   iv. Divide that budget and assign equally to each province
   v. From assigned budget, equally divide budget to the cities.
   vi. Print all details in a tabular form that shows all provinces and their members values. All cities and their member values.

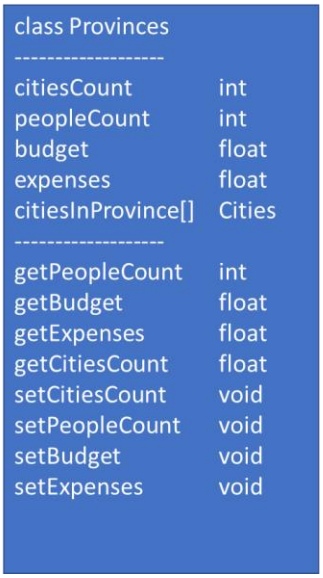
c. Write a function totalExpenses() which asks people count for each city. If each person has a service cost of last two digits of your id (k21-1234 → 34) then calculate total expenses for each city.

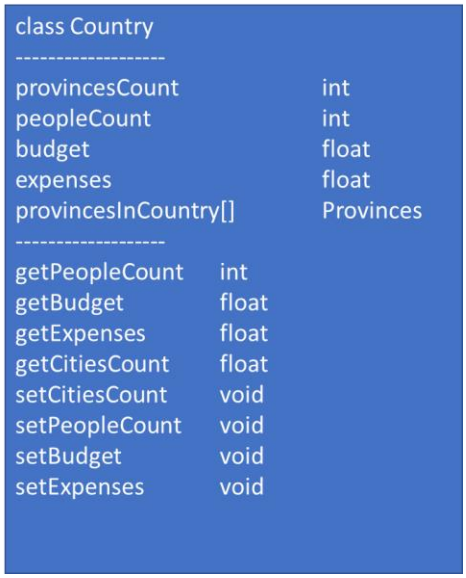
d. Write a functiontotalExpenses2() which uses expenses values of cities and calculates total expenses of provinces and the country.

e. Write a function highestExpensesP() which prints details of the province with highest expenses.

f. Write a function finalFunction() which prints profit or loss using budget and expenses members for each province in a tabular form.







Question # 3: *Programming*

Create a SavingsAccount class. Use a static data member annual InterestRate to store the annual interest rate for each of the savers. Each member of the class contains a private data member savingsBalance indicating the amount the saver currently has on deposit. Provide member function calculateMonthlyInterest that calculates the monthly interest by multiplying the balance by annualInterestRate divided by 12; this interest should be added to savingsBalance. Provide a static member function modifyInterestRate that sets the static annualInterestRate to a new value. Write a driver program to test class SavingsAccount. Instantiate two different objects of class SavingsAccount, saver1 and saver2, with balances of $2000.00 and $3000.00, respectively. Set the annualInterestRate to 3 percent. Then calculate the monthly interest and print the new balances for each of the savers. Then set the annualInterestRate to 4 percent, calculate the next month's interest and print the new balances for each of the savers.

Question # 04: *Programming*

A small airline has just purchased a computer for its new automated reservations system. You've been asked to program the new system. You are to write a program to assign seats on each flight of the airline's only plane (capacity: 10 seats).

Your program should display the following menu of alternatives—Please type 1 for "First Class" and Please type 2 for "Economy". If the person types 1, your program should assign a seat in the first class section (seats 1–5). If the person types 2, your program should assign a seat in the economy section (seats 6–10). Your program should print a boarding pass indicating the person's seat number and whether it's in the first class or economy section of the plane.

Use a one-dimensional array to represent the seating chart of the plane. Initialize all the elements of the array to false to indicate that all seats are empty. As each seat is assigned, set the corresponding elements of the array to true to indicate that the seat is no longer available.

Your program should, of course, never assign a seat that has already been assigned. When the first class section is full, your program should ask the person if it's acceptable to be placed in the economy section (and vice versa). If yes, then make the appropriate seat assignment. If no, then print the message "Next flight leaves in 3 hours."

Question # 05: *Class Diagram*

A private dental practice wishes to computerize its patient records system. A patient must register with the practice and the system needs to store their name, address and mobile telephone number. Each patient is given a unique seven digit patient number. The system will keep a count of how many patients the practice currently has. Patients can book an appointment with a particular dentist; the system needs to store the date of the appointment and if the patient attended. A text message will be automatically sent out two working days before the appointment. After the appointment the dentist update the system with the cost of the treatment undertaken.

The practice employs two types of staff: Receptionists and Dentists.

The system needs to record their details; which for all staff includes a four digit employee number, their name, address, gender, contact telephone number and next of kin.

Dentists must be qualified; the system will store their highest dental qualification, date awarded and their General Dental Council registration number. A list of appointment statistics is required at the end of each week. This will be a summary of how many patients turned up and how many were no-shows. If a patient repeatedly misses an appointment they will be charged a fixed amount of money. All receptionists must go on a first aid course every year. The system must record the date of when they last attended the course and the name of the course provider.