Part I: Advanced Programming (AP-OOAD) Lab - CSP318

Lab Assignment-6 (Introduction to C++/JAVA Concepts)

Objective: Implementation of Basic functionalities like templates, stream formatting, file input/output, and exception handling .

**Experiment 1:** Write a program containing statement for each of the following:

1. Print the following floating-point numbers with different field widths and precision:

123.456789 with a field width of 10 and precision of 2.

9876.54321 with a field width of 12 and precision of 4.

1. Print the integer 12345 with and without leading zeros, each in a field width of 10.
2. Print the string "Hello, World!" centered in a field width of 20.
3. Print the integer 54321 right-justified in a field width of 8 and fill the remaining spaces with '\*'.
4. Print the integer 12345678 in scientific notation with a field width of 12 and precision of 2.

**Experiment 2:**Write a program that accomplishes each of the following:

1. Create a user-defined class Complex that contains the private integer data members real and imaginary and declares stream insertion and stream extraction overloaded operator functions as friends of the class.
2. Define the stream insertion and stream extraction operator functions. The stream extraction operator function should determine whether the data entered is valid, and, if not, it should set **failbit** to indicate improper input. The input should be of the form 3 + 8i
3. The values can be negative or positive, and it’s possible that one of the two values is not provided, in which case the appropriate data member should be set to 0. The stream insertion operator should not be able to display the point if an input error occurred. For negative imaginary values, a minus sign should be printed rather than a plus sign.
4. Write a main function that tests input and output of user-defined class Complex, using the overloaded stream extraction and stream insertion operators.

**Experiment 3:**.You are the owner of a hardware store and need to keep an inventory

that can tell you what different tools you have, how many of each you have on hand and the cost of each one. Write a program that initializes the random-access file hardware.dat to 100 empty records, lets you input the data concerning each tool, enables you to list all your tools, lets you delete a record for a tool that you no longer have and lets you update any information in the file. The tool identification number should be the record number. Use the following information to start your file:

**Record # Tool name Quantity Cost**

3 Electric sander 7 57.98

17 Hammer 76 11.99

24 Jig saw 21 11.00

39 Lawn mower 3 79.50

56 Power saw 18 99.99

68 Screwdriver 106 6.99

77 Sledge hammer 11 21.50

83 Wrench 34 7.50

**Experiment 4:** Write a c++ program for implementing exception handling in a simulated online shopping system. The system allows users to browse products, add them to a cart, and proceed to checkout. Your task is to handle various exceptions that may occur during these operations to ensure the system's robustness and user-friendliness.Implement a class hierarchy for products, including different types such as **Electronics**, **Clothing**, **Book**s, etc. Implement a **shopping cart** class that allows users to add and remove products. Implement a checkout process that calculates the total price and handles payment.

Handle the following exceptions:

a. **Out of stock:** If a user tries to add a product that is out of stock to the cart.

b. **Invalid input:** If the user enters invalid data during checkout (e.g., non-numeric values for quantity).

c. **Insufficient funds:** If the user tries to make a purchase without sufficient funds in their account.

d. **Payment failure:** Simulate a payment failure scenario and handle it appropriately.

e. **Network issues:** Simulate network issues during the checkout process and handle them gracefully.

**Experiment 5:** Write a c++ program to manage student records that should allow users to perform various operations such as adding student records, updating existing records, searching for records, and deleting records. Define a class named **Student** with the following private data members:

* int rollNumber
* std::string name
* std::string address
* int age

Implement public member functions for the Student class to set and get the values of each data member.

Create a C++ program that provides the following functionalities:

a. Initialize a student database file named "**student\_records**" with 20 records containing default values for roll number, name, address, and age.

b. Allow users to input student information (roll number, name, address, age) for a given number of students and store this information in the database file.

c. Implement a search function that allows users to search for a student record by roll number. Display the details of the student if found; otherwise, show an appropriate message indicating that the record was not found.

d. Implement an update function that allows users to update the details of a student record by roll number. If the record is found, prompt the user to enter the updated information for the student; otherwise, display a message indicating that the record was not found.

e. Implement a delete function that allows users to delete a student record by roll number. If the record is found, delete it from the database file and display a confirmation message; otherwise, show a message indicating that the record was not found.

f. Handle exceptions for the following scenarios:

* Invalid roll number input (non-numeric input).
* Roll number not found during search, update, or delete operations.
* File read/write errors.
* Invalid age input (non-numeric input or negative age).

**Experiment 6:** Some information on the Internet may be encrypted with a simple algorithm known as “rot13,” which rotates each character by 13 positions in the alphabet. Thus, 'a' corresponds to 'n', and 'x' corresponds to 'k'. rot13 is an example of symmetric key encryption.

With symmetric key encryption, both the encrypter and decrypter use the same key.

a) Write a program that encrypts a message using rot13.

b) Write a program that decrypts the scrambled message using 13 as the key.