Assignment-5

Problem-1 (5 points):

State whether each of the following is *true* or *false*. If *false*, explain why.

a) Base-class constructors are not inherited by derived classes. True
b) When a derived-class object is destroyed, the destructors are called in the reverse order of the constructors. True
c) A class is made abstract by declaring that class virtual. False
d) All virtual functions in an abstract base class must be declared as pure virtual functions. False
e) If a base class declares a pure virtual function, a derived class must implement that function to become a concrete class. True

Problem-2 (15 points):

Package-delivery services offer a number of different shipping options, each with specific costs associated. Create a complete C++ program to represent various types of packages.

Create a base class Package that includes protected data members representing the name, address, city, state and ZIP code for the recipient of the package, the weight (in ounces) and cost per ounce to ship the package. Package class also contains a static data member ID and the following methods:

- A constructor Package(const string& name, const string& address, const string& city, const string& state, int ZIP, double weight, double cost) that creates a package with specified parameters. Don't forget to update an ID.
- The mutator functions setWeight and setCostPerOunce. The mutator functions should validate that the weight and cost per ounce contain positive values. If non-positive values were provided the class should throw an exception.
- A constant public member function calculateCost that returns a double indicating the cost associated with shipping the package. Package's calculateCost function should determine the cost by multiplying the weight by the cost per ounce.
- A constant public member function printPackageInfo that displays a package information in a following format:

```
-------------------------------------------------------
Package id 1:

Lou Brown
1 Main St
Boston, MA 11111

Cost: $4.25
-------------------------------------------------------
```

Create a derived class TwoDayPackage that inherits the functionality of base class Package, but also includes a data member that represents a flat fee that the shipping company charges for two-day-delivery service. TwoDayPackage class contains the following methods:

- A constructor TwoDayPackage(const std::string& name, const std::string& address, const std::string& city, const std::string& state, int ZIP, double w, double cost, double fee) that creates a package with specified parameters.
- The mutator function setFlatFee. The mutator function should validate that the flat fee contains a positive value. If non-positive value was provided the class should throw an exception.
- A redefined member function calculateCost so that it computes the shipping cost by adding the flat fee to the weight-based cost calculated by base class Package's calculateCost function.
- A redefined member function printPackageInfo that displays a two-day package information in a following format:

```
-------------------------------------------------------
Two Day Package id 2:

Lou Brown
1 Main St
Boston, MA 11111

Cost: $5.5
-------------------------------------------------------
```

Create a derived class OvernightPackage that inherits the functionality of base class Package, but also includes a data member representing an additional fee per ounce charged for overnight-delivery service. OvernightPackage class contains the following methods:

- A constructor OvernightPackage(const std::string& name, const std::string& address, const std::string& city, const std::string& state, int ZIP, double w, double cost, double fee) that creates a package with specified parameters.
- A redefined member function calculateCost so that it adds the additional fee per ounce to the standard cost per ounce and multiplies it by the package's weight.

- The mutator function setOvernightFeePerOunce. The mutator function should validate that the overnight fee contains a positive value. If non-positive value was provided the class should throw an exception.
- A redefined member function printPackageInfo that displays an overnight package information in a following format:

```
-------------------------------------------------
Overnight Package id 3:

Lou Brown
1 Main St
Boston, MA 11111

Cost: $14.875
-------------------------------------------------
```

Write a test program testPackages.cpp that tries to create a package object test1("John Smith", "1020 Orange St", "Lakeland", "FL", 33111, 0, 0.4), a two-day package object test2("Bob George", "21 Pine Rd", "Cambridge", "MA", 44444, 10.5, 0.65, -0.5), an overnight package object test3("Don Kelly", "9 Main St", "Denver", "CO", 66666, 12.25, 0.7, -1) to test an exception handling.

Then a test program creates a package object p1("John Smith", "1020 Orange St", "Lakeland", "FL", 33111, 10.5, 0.4), a two-day package object p2("Bob George", "21 Pine Rd", "Cambridge", "MA", 44444, 10.5, 0.65, 2.0), an overnight package object p3("Don Kelly", "9 Main St", "Denver", "CO", 66666, 12.25, 0.7, 0.25), and displays the result of p1.printPackageInfo(), p2.printPackageInfo(), and p3.printPackageInfo().

Here is a sample run:

```
Weight must be > 0.0
Flat fee must be > 0.0
Overnight fee must be > 0.0
-------------------------------------------------
Package id 1:

John Smith
1020 Orange St
Lakeland, FL 33111

Cost: $4.2
-------------------------------------------------
-------------------------------------------------
Two Day Package id 2:

Bob George
21 Pine Rd
Cambridge, MA 44444

Cost: $8.825
-------------------------------------------------
-------------------------------------------------
Overnight Package id 3:

Don Kelly
9 Main St
Denver, CO 66666

Cost: $11.6375
-------------------------------------------------
```

Rubric for Implementation Problems

0%	25%	50%	75%	100%
Source code files were not provided. Problem solution was not submitted.	Significant assignment requirements were ignored or violated. Program doesn't compile.	The output of the program was not shown. Lack of comments. Pour code readability (inconsistent indentation, variable naming, general organization)	Choosing a poorly approach to solve a problem, for example, solving a problem with hard coding instead of using a loop. Minor details of the program specifications were violated.	Program works correctly and meets the requirements of the assignment. Code is clean, well-organized, and well commented.

What to Hand In

For Problem 2 submit (upload) seven separate files Package.h, Package.cpp, TwoDayPackage.h, TwoDayPackage.cpp, OvernightPackage.h, OvernightPackage.cpp, testPackages.cpp. Please submit (upload) all your source codes to Canvas. **Please provide snapshots of all your results after running your code.**

```
C:\Users\bmt81\CLionProjects\untitled\cmake-build-debug\untitled.exe
Exception: 1
Exception: 3
Exception: 4
-------------------------------------------------
Package id 1:

John Smith
1020 Orange St
Lakeland, FL 33111

Cost: $0
-------------------------------------------------
-------------------------------------------------
Two Day Package ID 2:

Bob George
21 Pine Rd
Cambridge, MA 44444

Cost: $4.1125
-------------------------------------------------
-------------------------------------------------
Overnight Package ID 3:

Don Kelly
9 Main St
Denver, CO 66666

Cost: $2.45
```