

Final Exam of Computer Programming 2 (CSW 234)

Academic Year: 2017/2018

Level: 2nd Level

Semester: Fall 2017

Date: 23-12-2017

Time: 3 hours

Answer about the following questions

(Total: 60 marks)

Question 1:

[15 Marks]

A) Define the following object-oriented terms:

(i) *Abstract base class*, (ii) *Pure virtual function*.

B) Show the output of the following program:

```
class Point {
    protected:
        int x, y;
    public:
        Point(int xx=0, int yy=0)
        { x = xx; y = yy; }
        virtual void display()
        { cout << "(" << x << ", " << y << ")"; }
        virtual float getArea()
        { return 0.0; }
};

class Circle : public Point {
    private:
        float radius;
    public:
        Circle(int xx, int yy, float r): Point(xx, yy)
        { radius = r; }
        void display()
        { cout << "(" << x << ", " << y
          << ", " << radius << ")"; }
};

float getArea()
{ return 3.14*radius*radius; }
};

bool hasArea(Point* p)
{ Circle* c;
  c = dynamic_cast<Circle*>(p);
  return c ? true : false;
}

void Show(Point* shape)
{ cout << "\n"<<typeid(*shape).name() << ": "; }

void main () {
    Point* List[4];
    List [0]=new Circle (2, 6, 10.0);
    List [1]=new Point (4, 5);
    List [2]=new Circle (3, 4, 20.0);
    List [3]=new Point;
    for (int i=0; i<4;i++) {
        show(List [i])
        List [i]->display();
        if ( hasArea(List[i]) )
            cout << "area=" << List [i]-> getArea();
    }
}
```

Question 2:

[15 Marks]

A) Declare and implement a class *fraction* that has two data members: *num* and *denom*, (both of type *int*), which represent the fraction's numerator and denominator, respectively. It has two member functions: a 2-argument **constructor** that creates a *fraction* object and initializes its data members to given values, **an extraction operator** >> that reads the *num* and *denom* of a *fraction* object from the keyboard in fractional form (i.e. num/denom), and **an insertion operator** << that displays a *fraction* object in fractional form. It also has two overloaded operators + and *, for performing the

addition and multiplication operations on any two objects of class ***fraction***, respectively. Note that, the formulas for adding and multiplying two fractions a/b and c/d are as follows:

$$\frac{a}{b} + \frac{c}{d} = \frac{a * d + b * c}{b * d}, \quad \frac{a}{b} \times \frac{c}{d} = \frac{a * c}{b * d}$$

- B) Add an exception class, and throw an exception in the 2-argument constructor and the member function ***extraction operator >>*** if the entered value of ***denom*** is zero. Use an argument in the exception constructor to report where the error has occurred.
- C) Write a program that declares two objects of class ***fraction***, and repeatedly reads data for these two objects from the keyboard, then perform the two operations on them, displays the results, and asks the user whether he/she wants to continue or not.

Question 3:

[15 Marks]

- A) Declare and implement a class ***Date*** that has 3 **int** data members: day, month and year, and has a no-argument **constructor** that creates a ***Date*** object and initializes its data members to zeros, a 3-argument **constructor** that creates a ***Date*** object and initializes its data members to given values, and two member functions: ***get_date()*** that reads from the keyboard the data of a ***date*** object in the form dd/mm/yy, and ***show_date()*** that displays a ***date*** object in the form dd/mm/yy.
- B) Declare and implement a class ***Person*** that has 2 data members: **name** and **birthdate** (an object of class ***date***, defined in a), and has two member functions: ***get_person()*** that reads from the keyboard the data of a ***Person*** object, and ***show_person()*** that displays the data of a ***Person*** object.
- C) write a main program that reads a 10 of persons from the keyboard, and store them in a file called “pesons.dat”. Then, the program reads the persons from the file and displays their information.

Question 4:

[15 Marks]

- A. Define a base class **Employee** that has two data members **name** and **idno**. From this class derive two classes: **SalaryEmployee**, which adds a data member **salary**; and **TempEmployee**, which adds two data members: **hourlyPay** and **hoursWorked**. Each of the three classes should have two member functions: **Getdata()** to get its data from the user, and **Showdata()** to display its data.
- B. Write a program that creates an array of 10 pointers to **Employee**. In a loop, gets from the user data about a salary employee or a temporary employee, and use **new** to create an object of type **SalaryEmployee** or **TempEmployee** to hold the data, and then put the pointer to the created object in the array. When the user has finished entering the data for all employees, display the data for all employees entered.

With My Best Wishes