Philadelphia University Faculty of Engineering Department of Computer Engineering		Date:- 06/05/2015 Allowed time:- 60 minutes

Object Oriented Programming (630221) second Exam

Student Name: - …… ID: - ……

Question 1: mark the following statements as true or false.

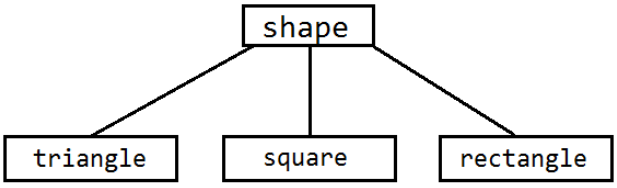
Copy constructor and assignment operator = are the same.	F
Abstract class is the class that all its methods are pure virtual methods	F
Friend function cannot access private data members of the class but can access the protected and public members	F
To override operator << we can use either friend or member function.	F
Template can create a general code to be used with different data types.	T

Question 2 :Perform the following

1. Write a statement that declares sales to be a pointer to a pointer of type double.
2. Write a C++ code that dynamically creates a two-dimensional array of five rows and seven columns and sales contains the base address of that array.
3. Write a C++ code that inputs data from the standard input device into the array sales.

```
double**  sales;
sales=new double*[5];
for(int i=0;i<5;i++)
{
      sales[i]=new double[7];
}
for(int i=0;i<5;i++)
      for(int j=0;j<7;j++)
            cin>>sales[i][j];
```

Questin 3: Given the following hierarchy of class



1. Define a class shape which will be an abstract base class

```
class shape{
public:
  virtual void display()=0;
  virtual double area()=0;
};
```

2. Define a class triangle which contains base and height attributes

```
class triangle:public shape
{
public:
  void display();
  double area();
  triangle(double,double);
private:
  double base;
  double height;
};
```

3. Define a class square which will contain side attribute

```
class square:public shape
{
public:
  void display();
  double area();
  square(double);
private:
  double side;
};
```

4. Define a class rectangle which will define width and height attributes

```
class rectangle:public shape
{
public:
  void display();
  double area();
  rectangle(double,double);
private:
  double width;
  double height;
};
```

Consider the main definition bellow which will use the class hierarchy you created.

```
int main()
{
      shape** sarr;
      sarr=new shape*[3];
      sarr[0]=new triangle(3,5);
      sarr[1]=new square(4);
      sarr[2]=new rectangle(6,2);

      for(int i=0;i<3;i++)
      {
            cout<<"shape info\n";
            sarr[i]->display();
            cout<<"shape area="<<sarr[i]->area()<<endl;
      }
      return 0;
}
```

Question 4: Given the following class classA perform the following:

1. overload operator << so you can output the value of x and y respectively
2. override the operator < where object a is less than object b if (a.x<b.x) or (a.x==b.x and a.y<b.y)

```
class classA
{
      public:
       void print() const;
      classA(int a,int b){x=a;y=b;}
private:
      int x;
      int y;
};
```

```
class classA
{
   friend ostream& operator<<(ostream& out,classA& obj);
public:
   bool operator<(classA& obj);
 void print() const;
classA(int a,int b){x=a;y=b;}
private:
int x;
int y;
};
bool classA::operator <(classA& obj)
{
   if((x<obj.x)||((x==obj.x)&&(y<obj.y)))
         return true;
   return false;
}

ostream& operator<<(ostream& out,classA& obj)
{
   out<<"x="<<obj.x<<"\ny="<<obj.y<<endl;
   return out;
}
```