Interfaces

1. (True/False) All methods in an interface must be declared public.

2. (True/False) When casting object types you take a risk of causing an exception.

3. When the compiler encounters one class inside another class, what does it do?
   A) It generates an error.
   B) It creates a separate `.class` file.
   C) It ignores the class.
   D) It compiles the code, but you will get an error at runtime.

4. Explain when you might want to use an inner class.

5. Consider the interface and classes below. Are there syntax errors? If yes, expain where and why.

```
public interface A
{
 void  a();
}


public class B implements A
{
 public void a(){}
}


public class C extends B
{
 public void d(){}
 public void a(){d();}

 public static void main(String[] args)
 {
      A b1 = new B();
      A c1 = new C();
      A temp = b1;
      b1 = c1;
      c1 = temp;
 }
}
```

6. (True/False) A non-static nested class cannot be instantiated without having creating an object of the outer class.

7. What is the problem with the code below?

```
public class TimerTest
{  public static void main(String[] args)
   { BankAccount account = new BankAccount(1000);
     class InterestAdder implements ActionListener
     {  public void actionPerformed(ActionEvent event)
        { double interes = account.getBalance()*RATE/100;
            account.deposit(interes);
            System.out.println("Balance = "
               + account.getBalance());
         }
      }
      InterestAdder listener = new InterestAdder();
      final int DELAY = 1000;
       Timer t = new Timer(DELAY, listener);
      t.start();
   }
   private static final double RATE = 5;
}
```

Event Handling

8. Event listener classes
   (A) report on events.
   (B) implement event listener interfaces.
   (C) contain detailed information about events.
   (D) generate user output.

9. Which of the following methods are part of the `MouseAdapter` interface?
   A) `mouseClicked //OK`
   B) `mouseEntered //OK`
   C) `mouseRightClicked`
   D) `mousePressed //OK`
   E) `mouseMoved`

10. In an event-driven program, the user is in control of how the data is:
    (A) input
    (B) stored
    (C) processed
    (D) output

11. Write an applet that draws your name in the mouse press position.

Inheritance

12. Consider a class `A` given below:

```
public class A
{  public String m1()
   { return "A"; }

   public String m2()
   { return "B"; }

}
```

Write a class `B` that extends the class `A` so that:

- the class `B` inherits exactly one method of the class `A`;
- the class `B` overrides exactly one method of the class `A`;
- the class `B` has exactly one its own method (i.e., a method that has signature that is different from the signatures of the methods in the class `A`).

You can choose your own functionality of the methods in the class `B`.

13. Polymorphic methods can be developed using:
    (A) inheritance
    (B) interfaces
    (C) aggregation

14. What is wrong with the code below:

```
public class CheckingAccount extends BankAccount
{  public void deposit(double amount)
   { transctCount++;
     deposit(amount);
   }
   ……
}
```

15. Consider the classes below:

```
class Counter
{  public Counter()
   { value = 0;}

   public int get()
   { return value;}

   public void click()
   { value++;}

   private  static int value;
}

class newCounter extends Counter
{}

class e6
{
  public static void main(String[] args)
  {  Counter c1 = new newCounter();
     Counter c2 = new newCounter();
     c1.click();
     c2.click();
     c1.click();
     c2.click();

     System.out.println(c1.get() + " "+ c2.get() );
  }
}
```

What will be printed when the main method of class e6static will be executed?

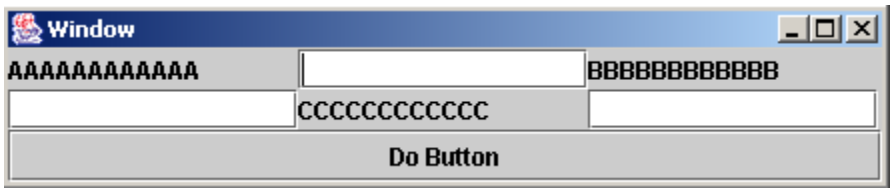
GUI

16. (True/False) When implementing your own `paintComponent` method, you MUST call the `paintComponent` method of the superclass.

17. Three useful layout managers are:
    A) border layout
    B) flow layout
    C) grid layout
    D) frame layout
    E) panel layout
    F) graphical layout
    G) swing layout
18. What type of layout do you have to use so that the individual components grow to fill the area given to them?

19. For a frame with a complex user interface, use a subclass of ____ to hold multiple components.

20. Write a GUI application that draws a frame window below. To make the things simpler do not define and install listeners.



Exceptions

21. Given the code segment below, what will be printed if no error occurs in the try block?

```
try
{
    ...
}
catch (IOException ex)
{
    System.out.println("I/O error");
}
catch (NumberFormatException ex)
{
    System.out.println("Bad input");
}
System.out.println("Done");
```

Streams

22. Write a method that reads a `String` with length `n` from a `RandomAccessFile` from position `m`.

Class Design

23. What relationship is appropriate between the following classes:

- `University – Student`
- `Student- TeachingAssistant`
- `Student-Professor`
- `Car-Door`
- `Truck-Vehicle`
- `Traffic-TrafficSign`

Recursion

24. As my academic predecessor Fibonacci, I invented also my sequence, the Smirnov sequence. Here is the program that computes the fourth element of the Smirnov sequence. Your task is to determine what the program below prints (i.e., to determine the value of the fourth element of the Smirnov sequence).

```
public class e4
{
     public static void main(String[]  args)
     {
          System.out.println(smirnov(4));
     }

     public static int smirnov (int n)
     {  if (n <= 2)
           return 1;
         else
            return smirnov(n-1)+smirnov(n-2)+smirnov(n-3);
     }
}
```