Object Oriented Programming  
V22.0470 Fall 2001  

Midterm Exam  

Write the answers to question 1 and 2 on this sheet. Write the other answers in the exam booklet.

1. True/False. Please circle the correct answer on this sheet.
   (a) T F In Java, the expression (x instanceof Object) returns true whenever x is a variable that refers to an object of some user-defined class.
   (b) T F A Java interface can extend a Java class.
   (c) T F A static method of a class cannot create objects of that class.
   (d) T F A UML sequence diagram models the structural relationship (inheritance, containment, etc) between object types.
   (e) T F If class B extends class A in Java, then an object of class B is also an object of class A.
   (f) T F If a class C contains the main method and the class is defined in the package A.B, then you execute the program by typing java A.B.C.
   (g) T F static synchronized methods, e.g.

   ```java
   static synchronized void f() { .... }
   ```

   synchronize upon the this object.
   (h) T F If you extend the Applet class, you must override the init(), start(), stop(), and paint() methods in order for your code to compile.
   (i) T F Java compiles the Java source code to Java Byte Code, which then gets interpreted by the Java Virtual Machine.
   (j) T F The programming language we have studied so far derives its name, ultimately, from an island in the Pacific Ocean.

2. Multiple Choice. Circle the letter next to the correct answer.
   (a) Which one of the following is true?
      i. If an exception is raised in a method f and there is no try block in f that handles the exception, then f exits and the exception propagates to the method that called f.
      ii. If an exception is raised in a method f and there is no try block in f that handles the exception, then if f is not declared as throwing the exception, the entire program terminates.
      iii. If an exception is raised in method f and the exception is handled by a catch clause within f, then f resumes executing at the point in the code that the exception was raised.
      iv. The finally clause of a try block is executed only if an exception is not caught by a catch clause of that try block.
   (b) Which one of the following is not a necessary feature of an object oriented programming language?
      i. encapsulation of data and code into a single structure
      ii. threads
      iii. inheritance with subtyping
      iv. method overriding
   (c) Complete this sentence: A Java thread is
      i. any object that has a run() method
      ii. an object containing code that can run concurrently with other parts of a program.
      iii. required in order to display moving graphics inside a frame.
      iv. any object that implements the Runnable interface.
(d) Given the interface

```java
interface myInterface { void foo(); void bar(int x); }
```

which one of the following will **not** compile?

i. interface yourInterface extends myInterface {}

ii. class myClass implements myInterface { void foo() {} }

```java
void bar(int x) {}
```

iii. class myClass implements myInterface { public void foo() {} }

```java
public void bar(int x) {}
public void bar(int x, int y) {}
```

iv. interface yourInterface extends myInterface { void bar(int x, int y); }

(e) Which of the following is **not** true about UML class diagrams?

i. An arrow with a triangular head denotes an “is” relationship between classes.

ii. A line denotes a “uses” relationship between classes.

iii. A arrow with a diamond head denotes a “contains” relationship between classes.

iv. None of the above are true.

3. (a) Write the definition of a class `Person` that contains a `name` field of type `String` and an `age` field of type `int`. Then define two classes, `Dancer` and `DonutMaker`, that extend `Person` such that `Dancer` has an additional field called `Company` of type `String`, and `DonutMaker` has an additional field called `Shop` of type `String`.

(b) Define a class `Counting` that contains a method `DancersAges(Person[] a)`, such that `DancersAges` returns the sum of the `age` fields of the `Dancer` objects referenced by the array `a`. There is no need for an object of class `Counting` to be created in order for `DancersAges` to be called.

(c) Define a class `MainClass` containing the `main` method (for the entire program). `main` should create an array with 10 elements, namely 5 `Dancer` objects and 5 `DonutMaker` objects in alternating order, and pass the array to the `DancersAges` method, above. You can initialize the fields of the objects as you see fit.

4. What will be displayed when the program below runs?

```java
class MyThread extends Thread {
    static Object o = new Object();
    int n;
    MyThread(int x) { n = x; }
    public synchronized void run() {
        for(int i = n; i<n+5; i++) {
            System.out.println(i + " A");
            yield();
            synchronized(o) {
                System.out.println(i + " B");
                yield();
                System.out.println(i + " C");
            }
            yield();
        }
    }
}

class test {
    public static void main(String args[]) {
        MyThread t1 = new MyThread(0);
        MyThread t2 = new MyThread(10);
        t1.start();
        t2.start();
    }
}
```