#### **Sample Exam Questions:**

## Ques 1 – 10 points

Consider the following code:

```
public class mySet {
    ArrayList myElements = new ArrayList();

public boolean add(Object o) {
    myElements.add(o);
}

public Object remove() {
    if (myElements.isEmpty() == false)
        return myElements.remove(0); // removes & returns object at position 0
    return null;
    }
}
```

- a. What may happen if an object of the class mySet is used by multiple threads calling add() and remove() at the same time?
- b. Change the add() and remove() methods so that the class mySet can be safely used by multiple threads at once.
- c. Change the add() and remove() methods so that the method remove() will always return an object when used by multiple threads (by waiting until an object has been added).

### Ques 2 – 10 points

The following program contains code to handle different kinds of exceptions. Read it carefully in order to answer the questions that follow.

```
public class Exceptional {
    public static void main(String args[]) {
        int w, x, y, z;
        W = X = V = Z = -1;
        try {
            int[] someData = {0, 6, 2, 3};
            int[] myArray = null;
            int[] noData = {};
            System.out.println("Test 1:");
            w = foo(myArray, 2);
            System.out.println("Test 2:");
            x = foo(someData, 3);
            System.out.println("Test 3:");
            y = foo(someData, 5);
            System.out.println("Test 4:");
            z = foo(noData, 0);
        } catch (Exception e) {
            System.out.println("Hmmm... what happened?");
        System.out.println("w="+w + " x="+x + " y="+y + " z="+z);
    public static int foo(int[] a, int n) throws Exception {
        int result = 0;
        try {
            for (int i = 0; i < n; i++)
               result += a[i];
            result /= a.length;
        } catch (ArrayIndexOutOfBoundsException aioobe) {
            System.out.println("Oops!");
        } catch (NullPointerException npe) {
            System.out.println("Oh, my goodness!");
        } catch (ArithmeticException ae) {
```

```
System.out.println("Bad news.");
    throw ae;
} finally {
    System.out.println("result = " + result);
}
return result;
}
```

- a. Provide the output that would result from executing the above program.
- b. Suppose the line return result; was moved into the finally clause just after the println statement. Would the output be different? If so, write how it would differ. If not, explain why not.

# Ques 3 - 10 points

Instantiate an object of this class and show how you would run the code below? Explain what the code does and what will it print out.

Write code to instantiate four threads allowing each thread to complete the run methods in order of thread number. i.e. Thread 1 completes first, followed by second, third and so on.

#### Ques 4 - 10 points

- a. What is synchronization?
- b. What are Java locks?
- c. Why should programs avoid deadlocks?
- d. What is the effect of invoking the wait() method?

## Ques 5 – 10 points

1. Classes in the Java Collection Framework support generic types in Java 1.5. Show how to modify the following code to declare a TreeSet class for Doubles using generics, then add & get a Double object from the TreeSet.

```
// previously
TreeSet mySet = new TreeSet();
mySet.add( new Double(1.0) );
Double d = (Double) mySet.get(0);
// new code using generic types
```

# Ques 6-10 points

Suppose in Java you had the following class hierarchy:

```
class A {}
class B extends A {}
class C extends B {}
class D extends A {}
class E extends D {}
```

and suppose you had the following overloaded method definitions:

```
static void f(A a, D d) {}
static void f(B b, A a) {}
static void f(C c, D d) {}
```

Now consider the following invocations of f:

```
f(new A(), new E());
f(new C(), new A());
f(new C(), new E());
f(new B(), new D());
```

For each of these invocations, explain which f is called and why, or, if a call represents an error, explain why it is an error and whether the error is reported by the compiler or the runtime system.

#### Ques 7 - 10 points

Create an exception class (**NotAlphaNumeric**) using the extends keyword. Write another class Myfile that throws the exception when its constructors gets a filename that is either numeric or just contains alphabets. Write a method that will exercise your exception by creating an object of type Myfile with names that contain numbers only, alphabet only and alphanumeric characters.