

ICS 52 – Introduction to Software Engineering  
Final Exam – Fall, 2008

First Name: \_\_\_\_\_ KEY \_\_\_\_\_ Last Name: \_\_\_\_\_

1	2	3	4	5	6	7	Total
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1. (15 points) In homework 4, you used (hopefully) a technique for selecting test cases called equivalence partitioning. This technique has several steps. List those steps, and briefly explain what is done in each one.

- 1. Identify the set of all possible inputs.**
- 2. Select a basis for dividing that set into subsets/subdomains.**
- 3. Using that basis, define two or more subdomains.**
- 4. Select one (at least) test case input from each subdomain.**

2. (10 points) The textbook distinguishes *dynamic* testing techniques (which execute code) and *static* techniques (which don't). Name and briefly describe one static technique described in lecture or the textbook. Describe a situation where this static technique is superior to a dynamic approach.

**Reading      Peer review      Done by the compiler (lint)**  
**Walkthrough      Inspection      Fagan Inspection**  
**Correctness Proof      Stepwise Abstraction**

**Section 13.4 (in 3<sup>rd</sup> ed.)**

3. (25 points) You have been assigned to design test cases for black box testing of the two argument add method in `java.util.Vector<E>`. Here is part of its documentation:

**6 pts each for a, b, c; 7 pts for d.**

```
public void add(int index, E element)
```

Inserts the specified element at the specified position in this Vector. Shifts the element currently at that position (if any) and any subsequent elements to the right (adds one to their indices).

- (a) What is the input domain of the `add` method?

**Vector object (this), an int, an object of type E.**

- (b) What is a basis for dividing the input domain you described into subdomains?

**One example: value of index.**

**Points off if not a well-defined basis for dividing the input domain.**

- (c) Using the basis defined in (b), specify 3 or 4 subdomains.

**Negative, 0, 1, length of Vector object, greater than length of Vector object.**

- (d) For each subdomain from (c), give a test case input and the expected output.

**Common mistake: leaving out the Vector.**

4. (15 points) You have been assigned to write test cases for black box testing of a function called `isRightTriangle`. Here is part of that function's documentation.

```
public static boolean isRightTriangle(int f, int g, int h)
Returns true if a right triangle exists with sides of length f, g, and h. Returns false
otherwise. Uses the Pythagorean Theorem.
```

To do your testing you need a testing oracle. Suggest two testing oracles that you could reasonably use here; the two should be completely different from each other.

**Examples:**

**Draw a triangle with the specified lengths and check by eye or otherwise whether any angles are right.**

**Use a calculator to determine whether the sum of squares of any two parameters equals the square of the other.**

**Do the calculations by hand.**

5. (15 points) In this class you have designed and run unit tests, and you have written partial plans for integration testing and acceptance or system testing. Name and briefly describe two other kinds of testing that were discussed in lecture or the textbook.

**Stress testing – high volume**

**Beta testing – done by customers**

**Regression testing – rerun test cases to make sure a modification doesn't introduce new bugs**

**White box / structural testing – uses the source code to determine the adequacy of the test set**

**Black box / functional testing – test cases based on the desired functionality of the application**

6. (5 points) What is the difference between white-box testing and black-box testing?

**They have different ways of choosing test cases. 2 points for describing the two approaches without identifying this difference.**

7. (15 points) Draw and label a diagram of the spiral software process model.

**See second ed., p. 63; third ed., p. 62.  
3 pts for overall structure; 3 pts for each quadrant**