Linköpings universitet

Exam
TDDD04: Software Testing
Wednesday May 28, 2008

- No aids beyond writing equipment are accepted.
- Write clearly! Please use only one side of each paper and don't address more than one question per page.
- Justify your answers!
- Leave room for comments during grading.

Good luck!

- Inga hjälpmedel förutom skrivmedelar tillåtna. Skriv tydligt!
- Skriv bara på en sida av pappret och behandla bara en uppgift per pappersblad.
- Ge dina svar tydliga motiveringar.
- Lämna plats for kommentarer vid rättning.

Lycka till!

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(I) Basic Definitions:

1. Describe/Define the terminologies below: (2 p)

   - Error
   - Fault
   - Failure

(II) Unit & Integration Testing:

2. Complete the following sentence: (1 p)

   The objective of unit and integration testing is to ensure that …

3. Identify the Equivalence Classes (EC) for the following specification. (2 p)

   Specification: the program accepts three to five inputs which are 4 digit integers greater than 1000.

4. A right triangle is a triangle that has a 90 degree angle as one of its angles. One common addition to the triangle problem is to check for right triangles. Three sides constitute a right triangle if the Pythagorean relationship is satisfied: $c^2 = a^2 + b^2$. This change makes it convenient to require that the sides be presented in increasing order, i.e., $a \leq b \leq c$.

   Develop a decision table **and** test cases for the right triangle problem. (5 p)

5. What is the problem with the following decision table? (2 p)

	1-4	5	6	7	8	9
C1	T	F	F	F	F	T
C2	–	T	T	F	F	F
C3	–	T	F	T	F	F
A1	X	X	X	–	–	–
A2	–	X	X	X	–	X
A3	X	–	X	X	X	–

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6. Consider the following piece of code:

```
package src;

public class Simple {

  public int foo(int a, int b, int c, int d) {
    int retVal = -1;
    if (a < b) {
      if (c == d) {
        retVal = 0;
      } else {
        retVal = 1;
      }
    } else if (a > b) {
      retVal = 2;
    } else {
      retVal = 3;
    }
    if (a + b + c + d < 100) {
      retVal = retVal * 100;
    }
    return retVal;
  }
}
```

a) How many test cases are required to achieve statement coverage for the method foo? (1 p)

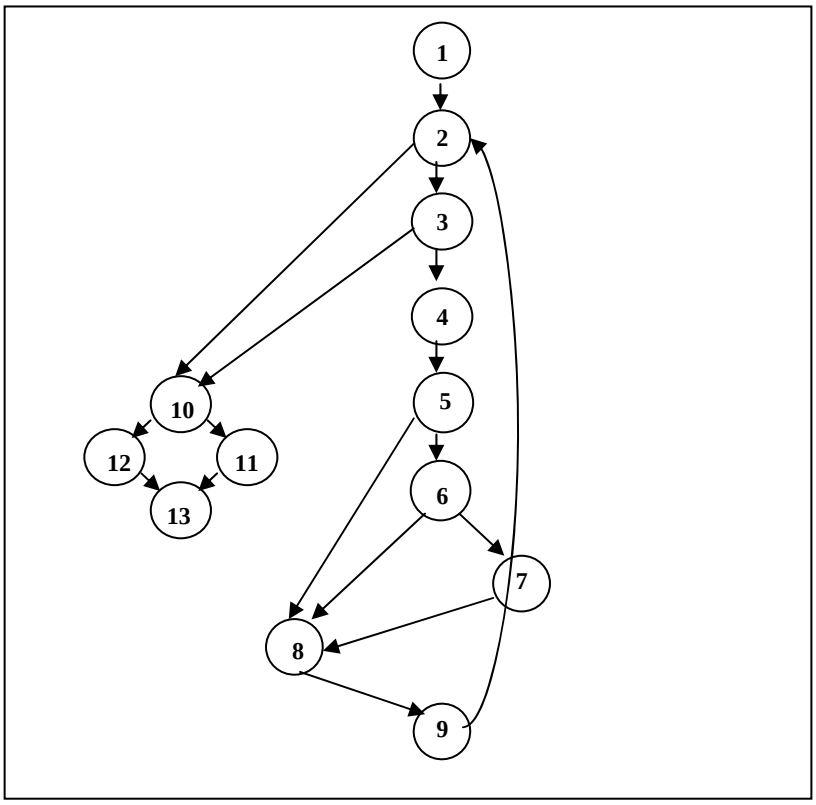
b) How many test cases are required to achieve branch coverage for the method foo? (1 p)

c) Complete the JUnit method testFoo() below by adding test cases for statement and branch coverage. Correct Java syntax is not necessary. (3 p)

```
public void testFoo() {
  Simple simple = new Simple();
  //Add your code here
}
```

7. An independent path is any path through the program that introduces at least one new set of processing statements or a new condition. Given the following flow graph,

   - compute the graph's Cyclomatic Complexity. (1 p)
   - determine a basis set of linearly independent paths. (4 p)



8. Name **and** describe two (of four) kinds of integration testing based on Functional Decomposition. (3 p)

(III) Sytem Testing:

9. For the following causes and effects, design a cause-effect graph **and** propose a decision table for testing the software. (5 p)

Requirements:
The system sends a message to the adm. operator about the safety of the lake level
Design description:
***Input*:** the syntax of the function is Level(A,B) where A is the height in meters of the water behind the dam, and B is the number of centimeters of rain in the last 24-hour period.
***Processing*:** The function calculates whether the water level is within a safe range, is too high, or is too low.
***Output*:** "Level = Safe" when the result is safe or low; "Level = High" when the result is high; "Invalid Syntax

Causes:

- C_1: The first five characters of the command are "Level"
- C_2: The command contains exactly two parameters separated by a comma and enclosed in parentheses
- C_3: The parameters A and B are real numbers such that the water level is calculated to be Low
- C_4: The parameters A and B are real numbers such that the water level is calculated to be Safe
- C_5: The parameters A and B are real numbers such that the water level is calculated to be High

Effects:

- E_1: The message "Level = Safe" is displayed on the screen
- E_2: The message "Level = High" is displayed on the screen
- E_3: The message "Invalid Syntax" is printed out

(IV) Test Automation:

10. Name **and** explaine four attributes that describe the quality of a test case (good test case). (2 p)

11. Describe 3 of the following Scripting techniques. (3 p)

    - Linear
    - Structured
    - Shared
    - Data driven
    - Keyword driven

12. Name different parts of test activities. Which parts are most suitable for test automation and why? (2 p)

13. Test input generation is an important part of test case design. Automated test case generation can generate a complete set of test cases with respect to their sources.

    Name **and** describe three different sources used in test case generation. (3 p)

14. Refactoring: (3 p)
    a) what is refactoring?
    b) when to refactor?

15. Model-based testing pushes the level of automation even further by automating the design, not just the execution, of the test cases.

    True or False: (3 p)
    a) Model-based testing can only be applied to system testing.
    b) The main use of model-based testing is to generate performance tests.
    c) Model-based testing is a form of black-box testing.

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