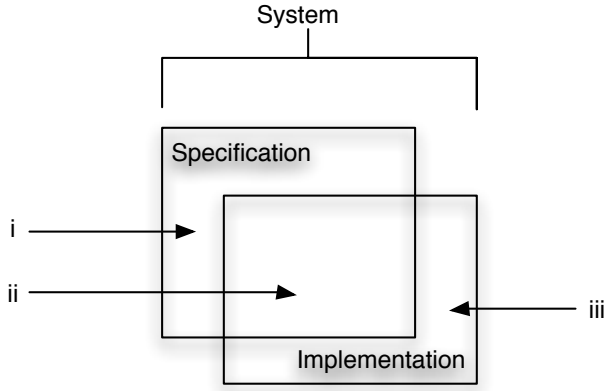
Examination, ETS200/TFRN 10
Lund University, Department of Computer Science
Time: 2011-03-10, 14:00-19:00
Place: MA10i,j
Assessment: total 60 points, at least 30 points is required in order to pass the exam.

1. a) Define the terms *error, failure* and *fault*. Give an example of each. (3p)
   b) Put the three terms in right place in the following sentence. (1p)
   A programmer made a(n) _____which resulted in a(n)_____ in the code, which when executed, manifested itself as a(n)_____

2. a) Define what is meant by *white box* and *black box testing strategies*, respectively.(2p)
   b) An example system has a mismatch between its specification and implementation, according to the figure below. Which sets of functionality, a, b and c may be tested by *white box* and *black box testing strategies*, respectively. Motivate your answer. (3 p)



3. For the procedure `speedingfine` below,
   a) draw the control flow graph, calculate the McCabe Cyclomatic number, define the test cases needed to achieve 100% path coverage. (5p)
   b) Set up def-use tables for all four variables, and define minimum test cases needed to achieve 100% def-use coverage. (4p)

   Note that test cases should include both input values and expected output.

```
1 procedure speedingfine (in age, in overspeed; in/out
licencemark, out fine);
2 begin
3   fine := 0;
4   if ((age>=25)and(overspeed<30)and(licencemark <3)) then
5      fine := fine + 100*overspeed;
6   else
7   begin
8       if ((age<25) or (licencemark >=3)) then
9            fine := fine + 200*overspeed;
10      if (overspeed>=30) then
11           begin
11             fine := fine + 5000;
12             licencemark:= licencemark +1;
13           end;
14   end;
15 end;
```

(continued)

4. A mobile telephone may be configured in a number of ways, changing the following parameters:
   - Operator: Telia, Tele2 or Telenor
   - Network: 3G or WLAN
   - Feature: Voice only, or voice and data
   - Plan: flat rate or time based

   a) List one minimum test set to cover all pairwise interactions between parameters. (3 p)
   b) How many tests are needed to cover all three-way interactions? (2 p)

5. a) Compare reviews to dynamic testing. Discuss advantages and drawbacks of both methods. (3 p)
   b) Describe inspection as a type of technical review. In order to get full points, you should describe inspections in general, the process, the roles of team members and suggested team size. (5 p)

6. Measurements of software faults and failures constitute the basis for different kinds of decisions, e.g. when to stop testing. However, the collection of such data may be sensitive, and the interpretation of such measurements may be ambiguous. Elaborate at least two different explanations for the measurements in the following situations:
   a) The first three weeks of system testing has found about 75 failures per week. These were corrected, and in the next three weeks system tests reveal only 5-10 failures per week. What can be said bout the software?
   b) In functional testing, 3 defects per hour of testing are reported, while for unit testing, only 0.2 defects per hour of testing are reported. What can be said about the efficiency of unit vs. functional testing?
   c) A development unit has as a goal to reduce the number of open (i.e. not yet fixed or rejected) defect reports to 5% of the weekly submitted number of detect reports. How can this be achieved? (6 p)

7. Develop black box test cases for a software component that handles withdrawal from debit cards for the fees for a toll-road. Use equivalence class partitioning, and cover each equivalence class at least once. The price is lower if you use a special rebate debit card instead of a general debit card. The module reads the card type, amount on the card and the weight of the vehicle, and withdraws the amount if the withdrawal is accepted. Prices for passage are:

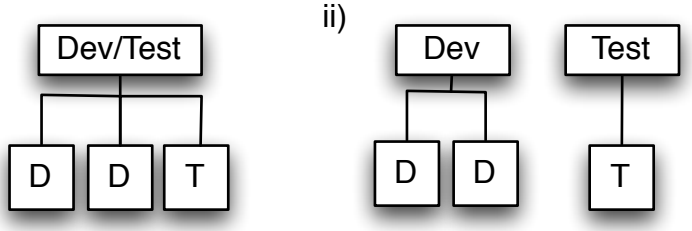
Rebate debit card	*General debit card*
0.02 kr/kg	0.03 kr/kg

   Be sure to list any assumptions you make and label equivalence classes that you use. Each test case should include test case identifier, input values, expected output values, valid and invalid equivalence classes covered. (7p)

(continued)

8. Testers may be organized in many different ways in relation to the development. The basic principles i) integrated under one management, versus ii) under separate management, are illustrated in the figure below.

i) ii)



Discuss pro's and con's with the two approaches. To get full points, you should cover competence provisioning, communication, management, and scale-up to large-size organizations. (8p)

9. A company plans to use Test Maturity Model (TMM) to improve its test process.
   a) Describe in general the levels of TMM. (5p)
   b) How can TMM be used to improve the test process in a company? Describe a fictive scenario instantiating the TMM assessment process. (3p)