

# Faculty of Engineering

## Kasetsart University

Final examination, 2011/2012, 2<sup>nd</sup> Semester  
219498: Special problems (IT Quality and Software Test)  
Friday, 10<sup>th</sup> of February, 2012

Section 450  
Lecturer: Uwe Gühl  
9.00 am until 11.00 am

Name: \_\_\_\_\_ ID: \_\_\_\_\_

Points: \_\_\_\_\_ / 60 Mark: \_\_\_\_\_

Instructions: Read the following guidelines thoroughly before starting working on the exam

### 1 Nature of exam and scoring rules

- 1.1 There are Multiple-Choice-Questions and open questions on next pages. Maximum 60 points are available. You should attempt to complete every question. The exam spans 16 pages in total, including this cover page.
- 1.2 For the Multiple-Choice-Questions: Choose only ONE choice that you believe is correct (or most suitable). Mark your selected choice with a crossing sign (X) for each respective question. Marking more than one choice for each question is considered invalid and no points will be given. Exception: For question 4.5 select for each statement a crossing sign (X) in the correct column.
- 1.3 For the open questions: Enter the correct answer.
- 1.4 The points to be achieved are listed in every question.

### 2 Exam policy during exam session

- 2.1 No books, lecture notes, or any kind of documents, including calculators, are permitted.
- 2.2 Use only blue or black inked pens to write your name, student ID, on the exam sheet.
- 2.3 Do NOT separate any exam page from the exam set, or it will be considered an attempt to cheat.
- 2.4 Turn off all communication devices, or it will be considered an attempt to cheat.
- 2.5 No discussions/talking among students are permitted, or students involved will be considered cheating.
- 2.6 At the expiration of exam time, students are to return the complete exam set to the exam proctor.

### 3 Policy for cheating

Should you be caught for an attempt to cheat, regardless of the situations, you will automatically be given an F grade for this course, and be reported to the board of exam committees for further necessary disciplined penalties by the dean and chancellor offices.

#### **Board of Examination Committee**

Thanya Kiatiwat	(Head of Committee Members)
Putchong Uthayopas	(Committee Member)
Arnon Rungsawang	(Committee Member)
Uwe Gühl	(Committee Member)

# 1 Fundamentals of Testing

[ / 6]

## 1.1 Which of the following is NOT a testing objective?

[ / 1]

- a) Finding defects. ☐
- b) Gaining confidence about the level of quality and providing information. ☐
- c) Preventing defects. ☐
- d) Debugging defects. ☒

## 1.2 Why should tests get prioritized?

[ / 1]

- a) to shorten the time required for testing. ☐
- b) to do the best testing in the time available. ☒
- c) to do more effective testing. ☐
- d) to find more defects. ☐

## 1.3 Why do developers have difficulty testing their own work?

[ / 1]

- a) Lack of technical documentation out of the source code. ☐
- b) Lack of test tools on the market for developers. ☐
- c) Lack of test related training. ☐
- d) Lack of objectivity. ☒

## 1.4 As part of which process activity do you determine the exit criteria?

[ / 1]

- a) Test planning and control. ☒
- b) Evaluating exit criteria and reporting. ☐
- c) Test closure activities. ☐
- d) Test implementation and execution. ☐

Name:

ID:

**1.5 What is the purpose of exit criteria?**

[ / 1]

- a) To specify when to stop the testing activity. ☒
- b) To set the criteria used in generating test inputs. ☐
- c) To identify when a software system should be retired. ☐
- d) To determine whether a test has passed. ☐

**1.6 What is the purpose of test completion criteria in a test plan?**

[ / 1]

- a) To plan when to stop testing. ☒
- b) To ensure that the test case specification is complete. ☐
- c) To know when test planning is complete. ☐
- d) To know when a specific test has finished its execution ☐

**2 Testing Throughout the Software Life Cycle [ / 5]**

**2.1 Which of the following is a Non-Functional test activity? [ / 1]**

- a) Unit testing. ☐
- b) Regression testing. ☐
- c) Smoke test. ☐
- d) Performance testing. ☒

**2.2 Why is incremental integration preferred over "big bang" integration? [ / 1]**

- a) Because incremental integration has better early defects screening and isolation ability. ☒
- b) Because "big bang" integration is suitable only for real time applications. ☐
- c) Incremental integration is preferred over "Big Bang Integration" only for "bottom up" development model. ☐
- d) Because incremental integration can compensate for weak and inadequate component testing. ☐

Name:

ID:

**2.3 Which of the following is NOT part of acceptance testing? [ / 1]**

- a) Integration testing. ☒
- b) Performance, load and stress testing. ☐
- c) Requirements-based testing. ☐
- d) Security testing. ☐

**2.4 Regression testing mainly helps in what? [ / 1]**

- a) Re-testing fixed defects. ☐
- b) Checking for side-effects of fixes. ☒
- c) Checking the core gaps. ☐
- d) Ensuring high level sanity. ☐

**2.5 What is alpha testing? [ / 1]**

- a) Post-release testing by end user representatives at the developer's site. ☐
- b) The first testing that is performed. ☐
- c) Pre-release testing by end user representatives at the developer's site. ☒
- d) Pre-release testing by end user representatives at their sites. ☐

### 3 Static Techniques

[ / 7]

#### 3.1 Which statement is TRUE?

[ / 1]

- a) Defects could be detected during static testing, failures could be detected only through dynamic testing. ☒
- b) Defects could be detected only during dynamic testing, failures could be detected through static testing. ☐
- c) Defects could be detected only during static testing, failures could be detected through static testing or dynamic testing. ☐
- d) Defects could be detected during static testing or dynamic testing, failures could be detected only through static testing. ☐

#### 3.2 What is the main purpose of reviews?

[ / 1]

- a) They help build good social relationships in the development team. ☐
- b) They reduce the need for documentation and test documentation. ☐
- c) They make it possible to find solutions for technical problems. ☐
- d) They reduce costs by reducing the number of faults before test execution. ☒

#### 3.3 What is the main task for a manager concerning reviews? [ / 1]

- a) To make sure reviews take place and that the participants have time to prepare and attend. ☒
- b) To check that the participants prepare well enough during individual preparation for a review. ☐
- c) To check that the documents fulfill the previously agreed upon rules and standards. ☐
- d) To choose the moderator to lead the review and follow up moderator performance and training. ☐

#### 3.4 Which tool should be used to detect unreachable code? [ / 1]

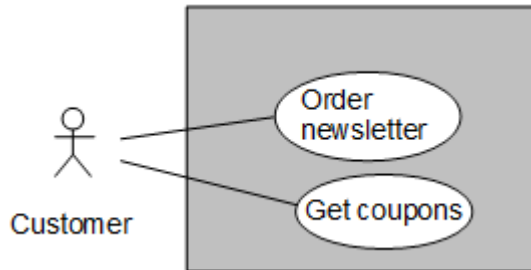
- a) Complexity calculation tool. ☐
- b) A dynamic analysis tool. ☐
- c) A coverage tool. ☐
- d) A static analysis tool. ☒

### 3.5 Review of requirements

[ / 3]

Following requirement for a web shop could be found in a specification:

1. Every customer may order a newsletter.  
The ordering of a newsletter is easy. The web shop gives a fast confirmation feedback with an email after ordering a newsletter.
2. VIP customer get coupons.  
A VIP customer gets per email coupons to save money in buying more items.

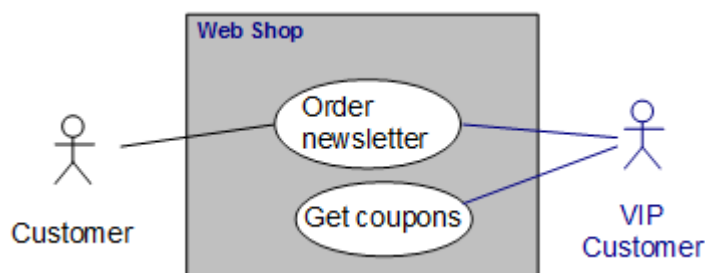


You are asked for a review. What would you update or change?

Which questions would you like to ask so that you could test this requirement?

Please add for each question a reasonable assumption as proposal.

- What means “easy”?  
Proposal: The ordering of a newsletter could be done in clicking on the button [Order newsletter], displayed on every page. Then a web form gets displayed, where the customer may enter his email address.  
Additionally in the menu “Contact” it is possible to order the newsletter.
- What is a “fast confirmation feedback”?  
Proposal: The web shop gives in about 5 minutes a confirmation feedback with an email after ordering a newsletter. The newsletter will be sent only after the customer sent back the confirmation.
- How frequently coupons should be send out?  
Proposal: Coupons will be sent out by the web shop owner.
- Update of use case diagram: An additional role “VIP Customer” makes sense, “Web Shop” should be entered as system name.



## 4 Test Design Techniques

[ / 22]

### 4.1 Use case testing

[ / 3]

You got following requirement for a scheduler website:

After a meeting was scheduled, an attendee should get an invitation with a link to the scheduled meeting website, where several dates are proposed.  
The attendee should be able to enter in the scheduled meeting website his name and the dates, when he could attend. It should be possible to add or delete agreements on proposed dates at any time. The website should be accessible in less than 5 seconds.

a. How many test cases should be created? Give a brief explanation.

[ / 1]

**3**

- Main test case: Giving feedback about dates, when attendee could attend.
- Alternative test case Attendee would like to update dates (add / delete)
- Performance test case: Website should be accessible in less than 5 seconds.

b. Describe one test case in detail, following the template below:

[ / 2]

Test Case Name	Entering possible attendance dates	
Test Case Id	1	
Test Case Priority	1=high	
Pre conditions	Scheduler must have created schedule Attendee must have got invitation	
Post conditions	Possible attendance dates must be stored on schedule website.	
Description	Attendee enters possible days, when he could attend a meeting	
Role	Attendee	
Steps	Step description	Expected result
10	Opening email	Email is there, link to scheduled meeting
20	Opening website	Web site opens with schedule and several dates to choose
30	Enter Name	Name is visible
40	Enter values: "free" for dates, when attendance is possible, "busy" for all other	Dates are visible

Name:

ID:

**4.2 What is the consequence, if an expected result is not specified?**

[ / 1]

- a) We cannot run the test. ☐
- b) It may be difficult to repeat the test. ☐
- c) It may be difficult to determine if the test has passed or failed. ☒
- d) We cannot automate the user inputs. ☐

**4.3 What is typically tested using use case testing?**

[ / 1]

- a) User errors and the resulting problem messages. ☐
- b) Exceptions, special and wrong inputs. ☐
- c) The states and state transitions of the system. ☐
- d) The process flow through the system. ☒

**4.4 How is McCabe's cyclomatic complexity M defined?**

[ / 1]

If L = the number of edges/links in a graph

N = the number of nodes in a graph

P = the number of disconnected parts of the graph (e.g. a called graph or subroutine)

- a)  $M = L + N - P$  ☐
- b)  $M = L - N + 2P$  ☒
- c)  $M = L - N - P$  ☐
- d)  $M = L + N + 2P$  ☐

**4.5 Decide, if following test design methods are white box methods or black box methods.**

[ / 3]

Test design method	White box	Black box
Error guessing		x
Boundary value coverage		x
Design inspection	x	
Code coverage	x	
Walkthrough	x	
State transition coverage		x



**4.6 Describe the Test-driven development cycle.****[ / 2]**

- Add a test  
Each new feature begins with a test based on requirements.
- Run all tests and check, if the new test fails  
The added test should fail.
- Write some code  
New code should be added, so that the code meets all tested requirements.
- Run all tests  
Now all tests should pass.
- Refactor code  
If necessary, code can be cleaned up.
- Repeat  
Now new requirements could be implemented by starting the cycle again.

**4.7 Code coverage and code complexity****[ / 2]**

You got following report from a code coverage tool concerning a Java project:

Statement coverage:	40 %
Decision coverage:	26,7 %
Code complexity:	38

What should be the next activities to increase the quality?

- Increasing the number of test cases  
100 % decision coverage should be the goal.  
There should be an explanation by the responsible developer, if and why it could not be achieved.  
At least 100% statement coverage should be achieved.
- Refactoring the code to lower the code complexity  
It has been shown, that a code complexity of 38 had a probability of 50% of being fault-prone.

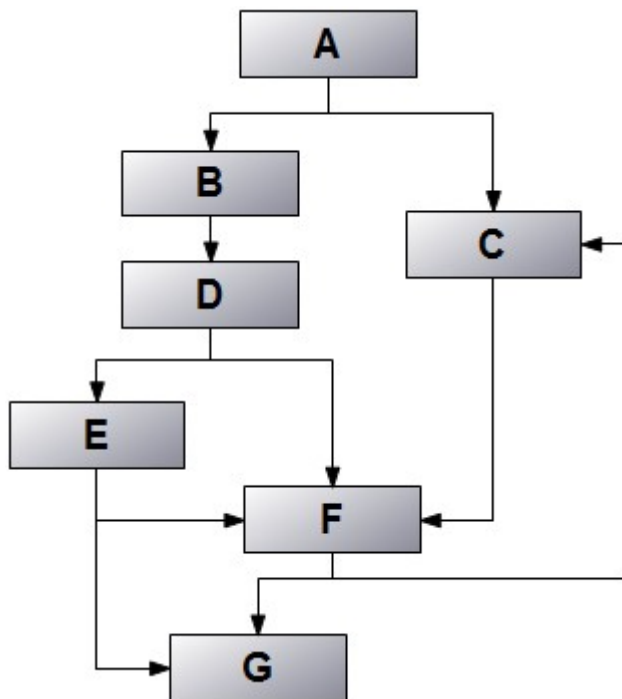
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## 4.8 Coverage and Code Complexity

[ / 5]

Following graph is representing a program:



One test has been executed for the control flow graph shown below, it covers path: **A, B, D, E, G.**

- a. How many tests are necessary to achieve 100 % Statement Coverage? [ / 1]

**1**

- b. Write down, which paths the required tests should cover to achieve 100 % Statement Coverage. [ / 1]

**A, B, D, E, F, C, F, G**

- c. How many tests are necessary to achieve 100 % Decision Coverage? [ / 1]

**4**

- d. Write down, which paths the required tests should cover to achieve 100 % Decision Coverage. [ / 1]

**A, B, D, E, G; A, B, D, E, F, G; A, B, D, F, G; A, C, F, C, F, G;**

- e. What is the value of McCabe's Cyclomatic Complexity M? : [ / 1]

**$M = L - N + 2 P = 10 - 7 + 2 \times 1 = 5$ , or  $M = b + 1 = 4 + 1 = 5$  (binary conditions)**

## 4.9 JUnit Test Cases

[ / 4]

In a system designed to work out the tax to be paid: An employee who has an income up to Thai Baht 150,000 has not to pay tax. If the income is Thai Baht 4,000,001 or more, the tax rate is 37%. Additionally there are following tax rates:

- Income Thai Baht 150,001 to 500,000: Income tax rate: 10%.
- Income Thai Baht 500,001 to 1,000,000: Income tax rate: 20%.
- Income Thai Baht 1,000,001 to 4,000,000: Income tax rate: 30%.

Following JUnit Test Cases have been prepared so far:

```
package thaiTax;
import static org.junit.Assert.*;
import org.junit.Test;

public class ThaiTaxTest {

    @Test
    public void testNoIncome() {
        ThaiTax myTax = new ThaiTax();
        assertTrue("Tax for no income: ", " 0 %" == myTax.getTax(0));
    }

    @Test
    public void testLowIncome() {
        ThaiTax myTax = new ThaiTax();
        assertEquals("Tax for low income: ", " 0 %", myTax.getTax(150000));
    }

    @Test

    @Test

}
}
```

a. How many Test Cases should be added? Give a brief explanation. [ / 2]

**4**, if we follow equivalence partitioning (Income tax rate 10%, 20%, 30%, 37%)  
**7**, if we test boundary values (150,001; 500,000; 500,001; 1,000,000; 1,000,001;  
 4,000,000; 4,000,001)

b. Add two Test Cases in the code above. [ / 2]

Name:

ID:

```
package thaiTax;
import static org.junit.Assert.*;
import org.junit.Test;

public class ThaiTaxTest {

    @Test
    public void testNoIncome() {
        ThaiTax myTax = new ThaiTax();
        assertTrue("Tax for no income: ", " 0 %" == myTax.getTax(0));
    }

    @Test
    public void testLowIncome() {
        ThaiTax myTax = new ThaiTax();
        assertEquals("Tax for low income: ", " 0 %", myTax.getTax(150000));
    }

    @Test
    public void testLowMediumIncome() {
        ThaiTax myTax = new ThaiTax();
        assertEquals("Tax for low medium income: ", "10 %", myTax.getTax(500000));
    }

    @Test
    public void testMediumIncome() {
        ThaiTax myTax = new ThaiTax();
        assertEquals("Tax for medium income: ", "20 %", myTax.getTax(1000000));
    }

    @Test
    public void testHighMediumIncome() {
        ThaiTax myTax = new ThaiTax();
        assertEquals("Tax for high medium income: ", "30 %",
            myTax.getTax(4000000));
    }

    @Test
    public void testHighIncome() {
        ThaiTax myTax = new ThaiTax();
        assertEquals("Tax for high income: ", "37 %", myTax.getTax(4000001));
    }
}
```

## 5 Test Management

[ / 16]

### 5.1 Which of the following alternatives are typical tester tasks (as opposed to test manager)?

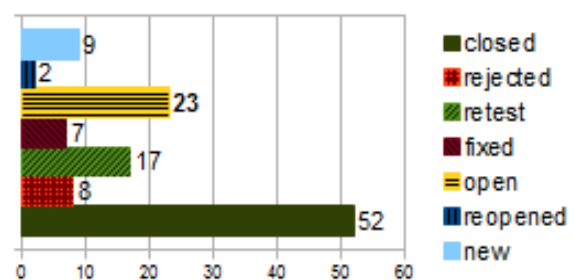
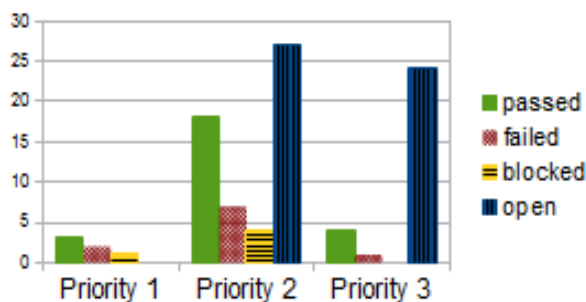
[ / 1]

- a) Set up configuration management of testware; review tests developed by others. ☐
- b) Plan and initiate the specification, preparation, implementation and execution of tests and monitor and control the execution. ☐
- c) Decide what should be automated, to what degree, and how. ☐
- d) Prepare and acquire test data; Review tests developed by others. ☒

### 5.2 Test report

[ / 3]

Yesterday following test report was presented concerning testing Software version 1.2:



Test Case Overview

Defect Overview

- a. What does it mean, that test cases are in status “blocked”? [ / 1]

Blocked test cases could not be executed, if they depend e. g. on the execution of failed test cases as pre condition.

- b. Today the planned delivery of Software version 1.3 was cancelled, after the smoke test failed. What is your proposal how to proceed with testing? Give a brief explanation. [ / 2]

Proceeding with testing of old Software version 1.2.

- There are still open test cases with priority 2 and priority 3 that could be used.
- There are still defects to be retested.

Name:

ID:

**5.3 Which of the following does NOT help in monitoring the Test Progress?**

[ / 1]

- a) Percentage of Test Case Execution. ☐
- b) Percentage of work done in test environment preparation. ☐
- c) Defect Information e.g. defect density, defects found and fixed. ☐
- d) The size of the testing Team and skills of the engineers. ☒

**5.4 Should the test environment be under configuration management?**

[ / 1]

- a) Yes, because a tester may need to restore the test environment. ☒
- b) Yes, because the testers need this information to install the test object for running the test. ☐
- c) No, because it is not part of the test object. ☐
- d) No, because configuration management concerns only the test object and test material. ☐

**5.5 What is the difference between a project risk and a product risk?**

[ / 1]

- a) Project risks are potential failure areas in the software or system; product risks are risks that surround the project's capability to deliver its objectives. ☐
- b) Project risks are the risks that surround the project's capability to deliver its objectives; product risks are potential failure areas in the software or system. ☒
- c) Project risks are typically related to supplier issues, organizational factors and technical issues; product risks are typically related to skill and staff shortages. ☐
- d) Project risks are risks that delivered software will not work; product risks are typically related to supplier issues, organizational factors and technical issues. ☐

**5.6 Which of the following statement is TRUE?**

[ / 1]

- a) An incident record should not include information on test environments. ☐
- b) The final stage of incident tracking is fixing. ☐
- c) Incidents may not be raised against documentation. ☐
- d) An incident may be closed without being fixed. ☒

Name:

ID:

**5.7 What should be the first activity, when you detected an incident?**

[ / 1]

- a) Show the incident directly to the developer. ☒
- b) Write an incident report. ☐
- c) Try to find as much information as possible how the incident could be fixed. ☐
- d) Collect it with all other incidents to present it in next defect meeting. ☐

**5.8 Explain the meaning of “severity” and “priority” in incident management!**

[ / 2]

- Severity  
How severe the impact on the system is.  
Typically values start with 1 (= very high, like system crash, data loss) to n (=very low, like spelling mistakes).
- Priority  
How urgent a defect has to be fixed.  
Typically values start with 1 (= very urgent, like a hot fix deployment) to n (=very low, like if time is left).  
Possible special status: “must not be fixed”.

**5.9 What is the most important missing in following incident report?**

[ / 1]

Content of an incident report:

- Date of incident, approvals and status.
- Scope, severity and priority of the incident.
- Reference to the test case that failed.

- a) Title. ☐
- b) Unique identifier ☐
- c) Author. ☒
- d) Screenshots or system logs. ☐

Name:

ID:

## 5.10 Incident report

[ / 4]

Content of an incident report:

Tester04: I executed Test Case 114 on 08.02.2012. First I opened an empty presentation using NiceOffice, version 2.2, operating system Windows 7, and entered some words. Then I opened the master (Menu View → Master → Slide Master). In the ruler I tried with left-hand mouse click to move the arrow to change the indentation. When I have updated and released mouse click, an hour glass appeared, and I couldn't use NiceOffice anymore.

Only solution: Closing NiceOffice, but then all data are lost. Took a screenshot "Master-Ruler-Crash.gif". Found a work around: Changing ruler position via Menu is possible.

Write a structured incident report in the template attached.

Attribute	Value
Incident Number	1
Summary	Update of ruler position in slide master via mouse click not possible
Detected on date	08.02.12
... by author	Tester04
Assigned to	Test Manager
Product	NiceOffice
Detected in version	2.2
Severity	2=High
Priority	2=Urgent
Status	New
Description	<p><b>Description:</b> Update of ruler position to change the indentation in the slide master with left-hand mouse click not possible.</p> <p><b>Steps to Reproduce:</b> 1. Open an empty presentation. 2. Entering some words. 3. Open the master (Menu View → Master → Slide Master). 4. In the ruler do left-hand mouse click to move the arrow to change the indentation. 5. Update and release mouse click.</p> <p><b>Expected Results:</b> Ruler position gets updated.</p> <p><b>Actual Results:</b> Hour glass appears, only closing application with data loss possible.</p>
Attachments	Master-Ruler-Crash.gif
Comments	Operating System: Windows7 Work around possible: Changing ruler position via Menu.
Links	Test Case 114



## 6 Tool support for testing

[ / 4]

### 6.1 How is a tool called that supports traceability, recording of incidents, and scheduling of tests?

[ / 1]

- a) A configuration management tool. ☐
- b) A test execution tool. ☐
- c) A bug tracker system. ☐
- d) A test management tool. ☒

### 6.2 Which statement is TRUE?

[ / 1]

- a) Performance testing tools can't be used if you are testing web applications. ☐
- b) Performance testing tools can be used to simulate large numbers of users on the system under test. ☒
- c) Performance testing tools are not able to simulate a load for more than 24 hours. ☐
- d) Performance testing tools can be used to derive the complexity of the code. ☐

### 6.3 How to start if you want a new testing tool?

[ / 1]

- a) Attend a tool exhibition. ☐
- b) Invite a vendor to give a demonstration. ☐
- c) Analyse your needs and requirements. ☒
- d) Find out what your budget would be for the tool. ☐

### 6.4 Which statement regarding the success factors for the deployment of a test tool is TRUE?

[ / 1]

- a) Implementing the new tool in a Big Bang implementation will ensure success. ☐
- b) Defining a test process in parallel with a tool deployment is recommended, if you want to achieve success. ☐
- c) To succeed in the deployment of a new tool, it is important to provide training and coaching for new users. ☒
- d) To succeed in the deployment of a new tool, only hard work is needed. ☐