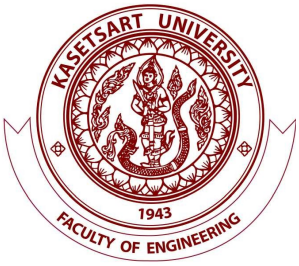


Faculty of Engineering

Kasetsart University

Midterm Examination, 2nd Semester, 2011 - 2012 — Section 450
219498 Special Problems (IT Quality and Software Test) — Lecturer: Uwe Gühl
Monday, 16th of January, 2012 — 1.00 pm until 3.00 pm

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 14 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 problem. Marking more than one choice for each problem is considered invalid and no points will be given. Exception: For question 2.7 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 [/ 16]

1.1 What is the goal of Software Tests? [/ 3]

- Finding defects
- High test coverage
- Statements concerning software quality

1.2 Why is testing necessary? [/ 1]

a) because software is likely to have faults ☒☐
b) because testing is included in the project plan ☐
c) to fill the time between delivery of the software and the release date ☐
d) to prove that the software has no faults ☐

1.3 How much testing is enough? [/ 1]

a) When all testing has been done as planned. ☐
b) It's depending on the size of the testing team. ☐
c) When it could be proved that the system works correctly. ☐
d) It's depending on the level of risk. ☒☐

1.4 Which of the following is TRUE? [/ 1]

a) Testing is a part of quality assurance ☒☐
b) Testing is not a part of quality assurance. ☐
c) Testing is same as debugging. ☐
d) Testing is the same as quality assurance ☐

1.5 Which statement concerning early testing is TRUE? [/ 1]

a) Early test design can prevent fault multiplication. ☒☐
b) Faults found during early test design are more expensive to fix. ☐
c) Early test design must not cause changes to the requirements. ☐
d) Early test design takes more effort than late test design. ☐

1.6 How do you call something that is incorrect in software? [/ 1]

a) An error. ☐
b) A failure. ☐
c) A mistake. ☐
d) A defect. ☒

1.7 Which of the following is a benefit of test independence? [/ 1]

a) Independent testers tend to be unbiased and find different defects than developers. ☒
b) Independent testers reduce the bottleneck in the incident management process. ☐
c) It does not require familiarity with the code. ☐
d) It is cheaper than using developers to test their own code. ☐

1.8 Which of the following is NOT an activity in the Fundamental Test Process? [/ 1]

a) Test Planning and Control. ☐
b) Test Implementation and Execution. ☐
c) Test Automation activities. ☒
d) Evaluating Exit criteria and reporting ☐

1.9 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 ☐

1.10 Why is it typically not possible to do exhaustive testing, meaning to test all inputs and preconditions? [/ 1]

- Due to the combinatorial explosion of input parameter, Complete testing is neither theoretically, nor practically possible.

1.11 What is the main reason to start testing early? [/ 2]

- To find defects early.
- As costs of defects increase, the later they are detected, early testing saves costs.

1.12 Describe two possibilities to improve communication and relationships between testers and others [/ 2]

- Start with collaboration rather than battles. Common goal of everyone: Better quality systems
- Communicate findings on the product in a neutral, fact-focused way, e.g. reproducible defect descriptions
- Write objective and factual incident reports and review findings.
- Do not criticize the person who created it.
- Try to understand how the other person feels and why they react as they do.
- Confirm that the other person has understood what you have said and vice versa.

2 Testing Throughout the Software Life Cycle [/ 14]

2.1 Non-Functional testing could be described BEST as [/ 1]

a) testing for functions that should not exist. ☐
b) testing to determine the compliance of a system to coding standards. ☐
c) testing to see if the system functions do not work. ☐
d) testing quality attributes of a system like performance and reliability. ☒

2.2 Which statement is TRUE? [/ 1]

a) Re-testing looks for unexpected side effects; regression testing is repeating those tests. ☐
b) Re-testing is done by developers, regression testing is done by independent testers. ☐
c) Re-testing means running a test again after a fix; regression testing looks for unexpected side effects. ☒
d) Re-testing is done after faults are fixed; regression testing is done earlier. ☐

2.3 At which test levels functional testing may be performed? [/ 1]

a) At system and acceptance testing levels only. ☐
b) At all test levels. ☒
c) At all test levels, but not at integration testing. ☐
d) At the acceptance testing level only. ☐

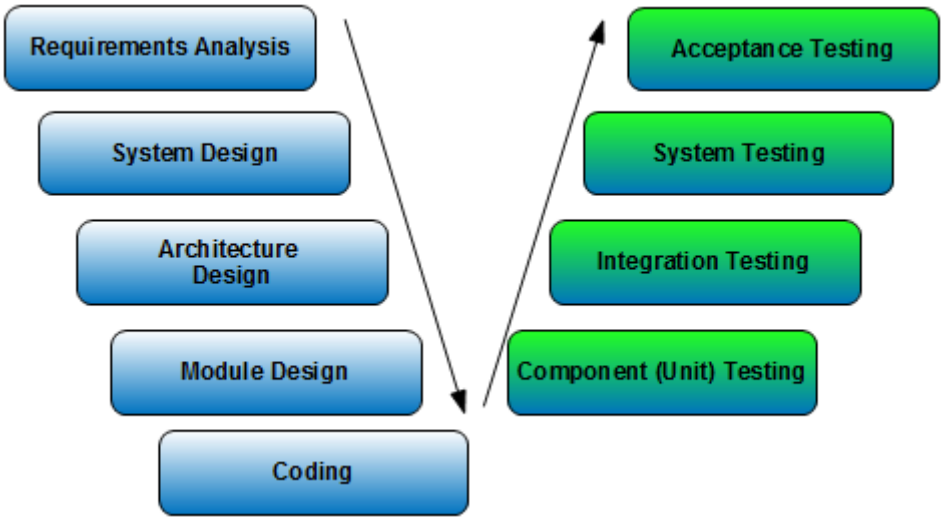
2.4 What is beta testing? [/ 1]

a) Testing performed by potential customers at the developers location ☐
b) Testing performed by potential customers at their own locations. ☒
c) Testing performed by product developers at the customer's location. ☐
d) Testing performed by product developers at their own locations. ☐

2.5 Maintenance testing is [/ 1]

a) updating tests when a system has changed ☐
b) acceptance testing by users to ensure that the system fulfils requirements ☐
c) retesting of defects during the development phase. ☐
d) testing a released system that has changed. ☒

2.6 Draw and explain the 'V' Model following ISTQB! [/ 5]



The V-Model is based on the Waterfall Model. The timeline moves from development activities "Requirements" to "Coding", then to testing activities from "Component (Unit) Testing" up to "Acceptance Testing".
For a development activity there is a corresponding testing activity.
On module design / coding level it is component testing. On architecture design level it is integration testing. On system design it is system testing, and on requirements analysis it is acceptance testing.

In an extended version test preparation activities are considered.

2.7 Decide, if following requirements are functional or non-functional requirements! [/ 3]

Requirement	Functional	Non-functional
System displays the number of records in the database	x	
System should display the heart rate, blood pressure and temperature of the patient connected to the patient monitor	x	
The system must handle concurrent logins from 2,000 user		x
Display of the patient's vital signs must respond to a change in the patient's status within 2 seconds		x
The command "next" will change the state of the canvas object to the next color.	x	
It must be possible to use the Web Shop on Internet Explorer Version 7 and higher, Firefox 2.0 and higher, Opera 9.00 and higher, and Google Chrome 1.0 and higher		x

2.8 Describe the difference between "Component Integration Testing" and "System Integration Testing". [/ 1]

- Component integration testing
  tests the interactions between software components and is done after component testing.
- System integration testing
  tests the interactions between different systems or between hardware and software and may be done after system testing.

3 Static Techniques [/ 9]

3.1 With static analysis it is NOT possible to find [/ 1]

a) the use of a variable before it is defined. ☐
b) memory leaks. ☒
c) array bound violations. ☐
d) unreachable or dead code. ☐

3.2 Which of the following are the main phases of a formal review? [/ 1]

a) Initiation, status, preparation, review meeting, rework, follow up. ☐
b) Planning, preparation, review meeting, rework, closure, follow up. ☐
c) Planning, kick off, individual preparation, review meeting, rework, follow up. ☒
d) Preparation,review meeting, rework, closure, follow up, root cause. ☐

3.3 What is the main difference between Static testing techniques and Dynamic testing techniques? [/ 1]

- Static testing techniques rely on the manual examination (reviews) and automated analysis (static analysis) of the code or other project documentation without the execution of the code. Static testing is typically an early test activity.
- Dynamic testing techniques requires the execution of software

3.4 Advantages of reviews [/ 1]

List three advantages of reviews:

- Early defect detection and correction
- Development productivity improvements
- Reduced development timescales
- Reduced testing cost and time
- Lifetime cost reductions
- Fewer defects and improved communication.
- Reviews can find omissions for example, in requirements, which are unlikely to be found in dynamic testing.

3.5 User Stories for requirements [/ 3]

Following requirement could be found in a specification:

> In a web shop are two different kinds of customers defined. A normal customer generates a business volume up to 1,000 Thai Baht. A VIP customer generates a business volume of 1,000 Thai Baht or more. These VIP customer get per email coupons, so they could save money in buying more items.
> Every customer may order a newsletter.
> An administrator should have the possibility to see how many customer visited the web shop and what business volume every customer generated.

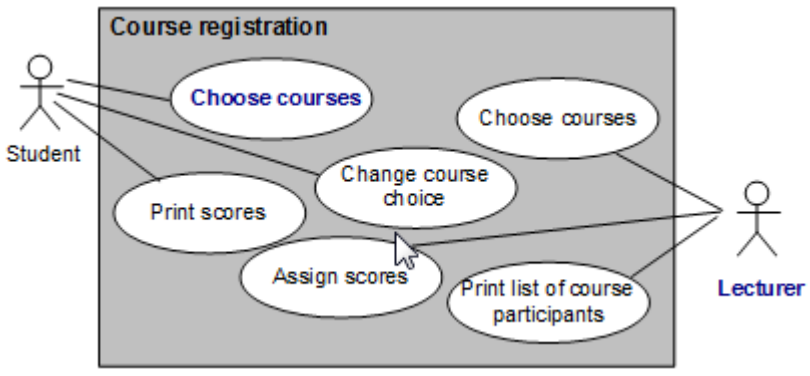
Write 3 User Stories out of the requirement. Use following template:
As a <type of user>, I want <some goal> so that <some reason>.

- As a customer I want to order a newsletter, so that I get new information from the web shop.As a VIP customer I want to get coupons, so that I save money in buying more items.
- As an administrator I want to see how many customer visited the web shop, so that I know how successful the web shop is
- As an administrator I want to see what business volume the customer generated, so that I know my customer better.

3.6 Use Case Diagram [/ 2]

You got following requirements description:

> The system “Course registration” should offer for students the possibility to choose a course to attend, to change their choice in case, and to print out their scores.
> The system should offer for lecturers that they could choose courses, assign scores to students, and to print the list of participants of a specified course.



Enter the missing information in the Use Case Diagram above.

4 Test Design Techniques [/ 21]

4.1 What are the differences between “White Box Testing” and “Black Box Testing”? [/ 2]

- White Box Test
  Testing with knowledge of the internals of the program
- Black Box Test
  Testing external behaviour of a program based on specification / requirements

4.2 Which of the following statements is TRUE for the equivalence partitioning test technique? [/ 1]

a) Makes use only of valid partitions. ☐
b) Uses both valid and invalid partitions. ☒
c) Must include at least two values from every equivalence partition. ☐
d) Divides possible inputs into one main partitioning class ☐

4.3 Why is a bidirectional traceability between test conditions and requirements requested? [/ 1]

a) to optimize defect reports ☐
b) to better assign testers to corresponding test cases ☐
c) for better calculation of the test effort in test execution phase ☐
d) for impact analysis when requirements change ☒

4.4 When should expected results for test cases ideally be defined? [/ 1]

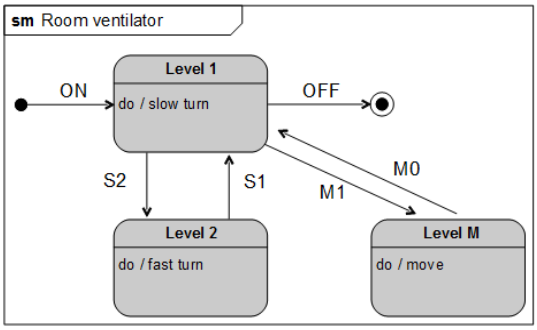
a) during test report generation ☐
b) before tests get executed ☒
c) during test execution ☐
d) when a defect was detected ☐

4.5 If there are no specifications, but business user who know the system are available: Which of the following would be the best test approach? [/ 1]

a) Experience based testing ☒☐
b) Structured testing ☐
c) Specification based testing ☐
d) Code coverage ☐

4.6 State diagram [/ 2]

Given the following state diagram.



i. Test Coverage [/ 1]
Which of the test cases below will cover the following series of state transitions?
InitialState – Level 1 – Level M – Level 1 – Level 2

a) ON, M1, M0, S1 ☐
b) ON, M1, M0, S2 ☒☐
c) M1, M0, S2 ☐
d) ON, M1, M0, S2, OFF ☐

ii. Invalid state transition [/ 1]
Which of the following represents an INVALID state transition?

a) Level M to Level 1 ☐
b) Level 2 to Level 1 ☐
c) Level 1 to Level 2 ☐
d) Level 2 to Level M ☒☐

4.7 Decision Tables [/ 1]

Given the following decision table: How many Test Cases would be needed at least for a full test coverage?

	Car Rental Rules	1	2	3	4	5	6	7	8
Conditions	Customer < 23 years	yes	yes	yes	yes	no	no	no	no
	Rental office at airport	yes	yes	no	no	yes	yes	no	no
	Customer has had already accidents	yes	no	yes	no	yes	no	yes	no
Actions	No car offer	x	x	x	x				
	Car offer with 10 % additional charge							x	
	Normal car offer					x			x
	Car offer with 10 % discount						x		

a) 4 ☐
b) 5 ☒
c) 7 ☐
d) 8 ☐

4.8 Equivalence classes [/ 1]

A software accepts months as numbers (1 = January, 2 = February, …, 12 = December). Which values would cover all equivalence classes?

a) 1, 2 ☐
b) 0, 6, 14 ☒
c) 3, 6, 12, 14 ☐
d) 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 ☐

4.9 Equivalance Classes and Boundary values. [/ 3]

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%.

a. How many Equivalence Classes could be identified? [/ 1]

5

b. Write down all Boundary Values. [/ 2]

150,000; 150,001; 500,000; 500,001; 1,000,000; 1,000,001; 4,000,000; 4,000,001

4.10 Car Configuration example. [/ 8]

Consider a software module that is intended to accept the name of a car and a number representing the power of the car in kW.
The specifications state that the name of the car should be represented by alphanumeric characters 3 to 15 characters in length. Each kW value may be a value in the range of 10 to 375, whole numbers only. Only one kW value may be entered for a car. The car name is to be entered first, followed by a comma, then followed by the kW value. Spaces (blanks) are to be ignored anywhere in the input.

a. Add for each derived Equivalence Class, if it is “valid”, “invalid”, or cannot be determined (“???”) [/ 4]

1. Car name is alphanumeric (_____)
(valid)
2. Car name is not alphanumeric (_____)
(invalid)
3. Car name is less than 3 characters in length (_____)
(invalid)
4. Car name is 3 to 15 characters in length (_____)
(valid)
5. Car name is greater than 15 characters in length (_____)
(invalid)
6. kW value is less than 10 (_____)
(invalid)
7. kW value is in the range 10 to 375 (_____)
(valid)
8. kW value is greater than 375 (_____)
(invalid)
9. kW value is a whole number (_____)
(valid)
10. kW value is a decimal (_____)
(invalid)
11. kW value is numeric (_____)
(valid)
12. kW value includes nonnumeric characters (_____)
(invalid)
13. No kW value entered (_____)
(invalid)
14. A kW value entered (_____)
(valid)
15. More than one kW value entered (_____)
(invalid)
16. Car name is first (_____)
(valid)
17. Car name is not first (_____)
(invalid)

18. A comma separates car name and kW value (_____)
(valid)
19. A comma does not separate car name and kW value (_____)
(invalid)
20. The entry contains no blanks (_____)
(???)
21. The entry contains blanks (_____)
(???)

b. Write down for following Test Cases 2 to 5 the expected outcome (T for TRUE or F for FALSE), and which Equivalence Classes are covered. [/ 4]

Example:

Test Case #	Test Data	Expected Outcome	Classes Covered
1	Abcdefghijklmnop	F	5

Test Case #	Test Data		Expected Outcome		Classes Covered
2	DDFF,400	a.	F	b.	8
3	FGH, 240	c.	T	d.	1, 4, 7, 9, 11, 14, 16, 18, 21
4	ABCdefghijklmno,50	e.	T	f.	1, 4, 7, 9, 11, 14, 16, 18, 20
5	VV200,20.5	g.	F	h.	10