UNIVERSITY OF OSLO

Faculty of Mathematics and Natural Sciences

Exam in: INF 4121
Day of exam: May 31th, 2016
Exam hours: 14:30-18:30
This examination paper consists of 8 pages.
Permitted materials: None
Answers are permitted in both English and Norwegian

Make sure that your copy of this examination paper is complete before answering. Make your own assumptions if you find the description of the exercise insufficient or you want to add something or make changes. Justify your assumptions and changes.

Task 1: Open-ended questions (15 points)

> *Note:*
> - *For the multiple-choice questions, only one possible answer is correct and can be selected. If you circle 0, 2 or more answers, the question will get zero points.*
> - *For the pair-up questions, draw the arrows corresponding to your choice of pairing. There is only one correct way to do the pairing.*

1. According to the ISTQB Glossary, regression testing is required for what purpose?
a) To verify the success of corrective actions.
b) To motivate better unit testing by the programmers.
c) To prevent a task from being incorrectly considered completed.
d) To ensure that defects have not been introduced by a modification.

2. Pair the following processes with their corresponding activities:

1. Test analysis	A. Group tests into scripts
2. Test plan	B. Write or extract a test summary report for the stakeholders
3.Test implementation	C. Transform the test objectives into test conditions and test cases
4. Test reporting	D. Establish the scope, objectives and risks of testing

3. Which of the following is a non-functional quality characteristic?
a) Accuracy
b) Reliability
c) Security
d) Regression

4. Which of these is a functional test?
a) Measuring how long it takes to upload a file to a cloud-based solution.
b) Checking the effect of high volumes of traffic in a call-center system.
c) Counting if the number of outputs is as expected.
d) Checking how easy is to use the software system.

5. Acceptance testing is not the responsibility of the development team. It is the responsibility of the customers, but the development team can assist in the process.
a) True
b) False

6. Static code analysis typically identifies all but one of the following problems. Which is it?
a) Unreachable code
b) Memory leaks
c) Violations of programming standards
d) Variables that are declared, but never used

7. In the _____ phase of a review activity, the moderator checks if the defects reported by the reviewers have been indeed fixed by the document author.

8. Should pre-conditions and post-conditions be part of a test case?
a) Yes
b) No

9. _____ is applied as test design technique when the inputs and the outputs of a software under test can be grouped in a way that exhibits similar behavior.

10. Pair the following roles with their typical activities:

Tester	Writes automated tests
	Gives recommendations to continue or stop the testing, based on the test execution results
	Introduces metrics for measuring the test progress
Test leader	Acquires and prepares test data
	Writes test summary reports for management
	Evaluates the results of the execution of tests: pass or fail

11. Which of the following metrics would be most useful to monitor during test execution?
a)   Number of testers versus number of developers in the team.
b)   Number of defects found and fixed.
c)   Number of test environments that should have been set up, but were abandoned.
d)   Percentage of requirements for which a test has been written.

12. Is it allowed to use low-fidelity prototyping when designing a user-centric software system?
a) Yes
b) No

13. What does it mean that a user interface is operable?
I.   All functionality can be operated by the same user.
II. All functionality is available from a keyboard.
III. All user interface is navigable with a keyboard.
a) I, II
b) I, III
c) II, III
d) I, II, III

14. _____ is a design issue of software for mobile devices. It occurs when the user touches by mistake some elements (links, buttons) or makes a gesture that unexpectedly initiates a feature.

15. Works in the _____ can be reproduced or used by anyone.

Task 2: Short questions (10 points)

1. What are the five fundamental test activities? Briefly describe their respective tasks from planning to closure.

2. Explain briefly the following terms:
   - regression testing
   - confirmation testing

3. Identify and describe three types of non-functional software characteristics.

4. How does testing depend on the development life-cycle for the software under test? (sequential and iterative-incremental)

5. Define and explain the purpose of entry criteria and exit criteria in software testing.

6. Summarize the potential benefits and potential risks a company may face when using test tools.

7. What is a decision table? Provide an example.

8. Explain the role of the personas in the study of accessibility. Provide an example of such a persona.

9. Provide two examples of issues that we may encounter with software running on mobile devices.

10. Describe the notions of:
    - public domain
    - fair use.

Task 3: Problems to solve (15 points)

Problem 1

A vending machine dispenses either hot or cold drinks. If you choose a hot drink (e.g. tea or coffee), it asks if you want milk (and adds milk if required), then it asks if you want sugar (and adds sugar if required), then your drink is dispensed.
Draw a control flow diagram for this example.
Given the following tests, what is the statement coverage achieved for the following tests:

- Test 1: Cold drink
- Test 2: Black coffee (no milk, no sugar)

What additional tests would be needed to achieve 100% statement coverage?

Problem 2

You have a savings account (Spar) in a bank that gives you a different interest rate, depending on the how much money you have in that account.
- if you have more than 0 NOK and up to 1.000,00 NOK (included), you will get 2% interest rate per year
- if you have more than 1.000,00 NOK and up to 10.000,00 NOK (included), you will get 3% interest rate per year
- if you have more than 10.000,00 NOK, you will get 4% interest rate per year

Note: it's not allowed to have a negative amount of money in the account.

Assume that after one year you decide to get rid of your savings account and open another super-savings account (Super-Spar) in the same bank. This second account works a bit different:
- If you have less than 5.000,00 NOK in the account, it will give you 5% interest rate per year.
- If you have more than 5.000,00 NOK in the account, it will give you 10% interest rate per year.
- Note: it's not allowed to have a negative amount of money in the account.

Which test design technique should you chose to check if both bank accounts give you correct interest rates?
Which is the minimum number of tests you need in order to completely check if both accounts give you correct interest rates? Please include in the counting the invalid cases as well.
Provide for each test listed above an example with a relevant input value.

Problem 3
Given the following extract of a requirement document for an e-commerce website:

```
Req.08: User must be able to add items to his shopping cart and continues

shopping


Pre-condition:

The user is logged-in the system.

The user already has a few items in the cart.


Main branch:

1. The user must be able to browse the shopping list, select items and

click "Add to cart".
```

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2. The system must update the user's shopping cart accordingly (items,
quantity, price)

3. The warehouse must decrease the inventory is the items added to the
cart.

4. The user must be logged out of the website.


Post-condition:

The user is logged out. The cart is empty.
```

Identify the issue in the use case scenario above and make an incident report (a.k.a. anomaly report) for it. Include in the incident report the information required cf. IEEE 829, presented in Lecture 05. If there are fields irrelevant to the issue, then fill them with "non applicable".

Task 4: Essay-type questions (10 points)

Test automation:

Provide a simple explanation for the process of test automation: a brief definition, the context in which it is used, discuss why is it important.
List the different interfaces for automated testing. Explain what can be tested through each.
Explain and compare the advantages and limitations of test automation.
List the main approaches for creating automated test cases
List the major success factors in test automation.

Manual testing of an ATM

An automated teller machine (ATM) is an electronic banking outlet, which allows customers to complete basic transactions without the aid of a bank employee.
Banks operate ATMs and customers can access them, even if they are or not customers of the bank owning the ATM. All the customers need is a valid bank card. The ATMs need to communicate with the bank's servers, in order to respond to customer's enquiries and actions.

There are two primary types of automated teller machines, or ATMs. The basic units allow the customers to only withdraw cash and receive a report of the account's balance. The more complex machines will accept deposits, facilitate credit card payments and report account information.

For the purpose of this exercise, we will only consider the basic type of ATMs.

Requirements:
- Imagine a version of such an ATM and write a brief description for it.
- Create a list with the manual tests that you would run on the ATM described at the previous point. Specify the actors that you took into consideration for your testing.
- Prioritize the list of tests created above, in function of their importance.
- Specify what you have left out of your list of tests and why.

Receipt printer

Money Dispenser

CPU

Rejec
Box

Card
Reader

Currency
Boxes