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**Day of exam:** May 27th, 2019

**Exam hours:** 14:30 - 18:30

**Permitted materials:** None

**Read this page thoroughly**

**The assignment consists of five parts.**

The first part is this introduction, while you shall answer the next four sections.

### **Part 2 - Multiple Choice questions**

- 15 multiple choice questions
- Questions with one answer alternative: 1 point for correct answer
- Questions with more than one answer alternative: 1 point for each correct answer, -1 for each wrong answer. However, it is not possible to get less than zero points for a question.
- Matching questions: 1 point for each successful match.
- Maximum score for part 2: 30 points

### **Part 3 - text exercises**

- 6 text assignments to be answered briefly and accurately.
- The number of points may vary from question to question.
- Maximum score for part 3: 30 points.
- *In this part you can draw sketches as a supplement to one of your text answers (assignment 3.2). Read the last paragraph of this title page thoroughly.*

### **Part 4 - Use of test techniques**

- Two test cases.
- 10 points for correct solution of each case.
- Maximum score for part 4: 20 points.
- *In this part you can draw sketches as a supplement to your text answers. Read the last paragraph of this title page thoroughly.*

### **Part 5 - Text about a given topic**

- Maximum score for part 5: 20 points

*If any tasks are unclear, you can make your own prerequisites. If so, please explain them.*

### **Sketching**

In this thesis you will be able to supplement 3 of the text assignments with digital handwriting assignment (assignments 3.2, 4.1 and 4.2). You use the sketch sheets you are given. It is possible to use multiple sheets per task. See instructions for filling out the sketch sheet on the desk.

You may NOT hand in sketch sheets for any other assignments than assignments 3.2, 4.1 and 4.2. You will NOT be given extra time to fill out the "general information" on the sketching sheets (task codes, candidate number etc.)

2.1 Match the following processes with their corresponding activities:

	Transform the test objectives into test conditions	Group tests into scripts	Write a test summary report for the stakeholders	Establish the scope and objectives of the testing
Test reporting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Test analysis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Test planning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Test implementation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Maximum marks: 4

2.2 When using structure-based (white-box) test techniques, which of the following alternatives could be used to assess the coverage ?

Select one or more alternatives:

- Conditions or multiple conditions exercised
- Boundaries exercised
- Decision outcomes exercised
- Partitions exercised
- Statements exercised

Maximum marks: 3

2.3 Which of the following is a benefit of test independence?

Select one alternative:

- It does not require familiarity with the code.
- Independent testers sometimes question the assumptions behind requirements, designs and implementations.
- It is cheaper than using developers to test their own code.
- Testers are better at finding defects than developers.

Maximum marks: 1

2.4 As part of which test process do you determine the exit criteria?

Select one alternative:

- Evaluating exit criteria and reporting
- Test planning
- Test control
- Test closure

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Maximum marks: 1

2.5 According to the ISTQB Glossary, which of the following alternatives is a test type?

Select one alternative:

- System testing
- Component testing
- Functional testing
- Acceptance testing

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Maximum marks: 1

2.6

A program validates a numeric field as follows:

**Values less than 10 are rejected, values between 10 and 21 are accepted, values greater than or equal to 22 are rejected.**

Which of the following input values cover all of the equivalence partitions?

Select one alternative:

- 3, 20, 21
- 3, 10, 22
- 10, 21, 22
- 10, 11, 21

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Maximum marks: 1

2.7 Which of the following are typical activities for a tester:

**Select one or more alternatives:**

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

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Maximum marks: 3

2.8 Which of the following are typical activities for a test leader:

**Select one or more alternatives:**

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

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Maximum marks: 3

2.9 What is beta testing?

**Select one alternative:**

- Testing performed by product developers at the customer's location.
- Testing performed by product developers at their own locations.
- Testing performed by potential customers at their own locations.
- Testing performed by potential customers at the developer's location.

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Maximum marks: 1

## 2.10 Impact Analysis helps to decide ...

**Select one alternative:**

- how many more test cases need to written.
- exit criteria.
- different tools to perform regression testing .
- how much regression testing should be done.

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Maximum marks: 1

## 2.11 Which of the followings are non-functional quality characteristics?

**Select one or more alternatives:**

- Configuration ability
- Portability
- Regression
- Usability
- Coverage

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Maximum marks: 2

## 2.12 Which of the following is MOST characteristic of specification based (black-box) techniques?

**Select one alternative:**

- Test cases can be easily automated.
- Test cases are independent of each other.
- Test cases are derived systematically from the delivered code.
- Test cases are derived systematically from models of the system.

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Maximum marks: 1

2.13 Which of the following of types of tools is MOST LIKELY to be used by developers?

Select one or more alternatives:

- Static analysis tools
- Test management tools
- Dynamic analysis tools
- Modeling tools
- Performance testing tools

Maximum marks: 3

2.14 What determines the level of risk?

Select one alternative:

- The cost of dealing with an adverse event if it occurs.
- The amount of testing planned before release of a system.
- The probability that an adverse event will occur.
- The likelihood of an adverse event and the impact of the event.

Maximum marks: 1

2.15 Match every stage of the Software Development Life cycle with the correct test level:

Please match the values:












	Functional and non-functional requirements	Global design	Business requirements	Code
Integration tests	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Acceptance tests	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unit tests	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
System tests	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Maximum marks: 4

- 3.1 One of the seven testing principles is called **Defect clustering**.  
What does "*Defect clustering*" mean and how does it affect the testing activities?

What are the remaining six principles?

Fill in your answer here

Format | **B** | *I* | U |  $x_2$  |  $x^2$  |  $I_x$  |  |  |  |  |  |  |  |  |  |  | ABC | 

Words: 0













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Maximum marks: 8

- 3.2** *Note that in this task you can answer both in the text editor and with sketches/drawings. Use the sketching paper handed to you in the exam room. See instructions on your desk.*

Draw a figure of the **V-model** that shows the different test activities and the different test levels. The figure should contain arrows that show the workflows and how the different test activities and test levels are related.

**Fill in your answer here**

Format | **B** | *I* | U |  $x_2$  |  $x^2$  |  $I_x$  |  |  |  |  |  |  |  |  |  |  |  | ABC | 

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Maximum marks: 5



## 3.3

**Equivalence partitioning (EP) and boundary value analysis (BVA)** can be applied more than once to the same item specification, depending what we are focusing on.













You shall now use EP and BVA in the following case:

**A company uses four digit pin codes on their doors.  
The pin-codes are in the range 1000 – 9999, both boundaries included.**

In this case, you shall use EP and BVA in at least **three different ways** with respect to different points of view. For each way, you shall identify:

- the equivalence partitions, both valid and, if present, invalid partitions
- and, if present, boundary values

**Fill in your answer here**

Format | **B** | *I* | U |  $x_2$  |  $x^2$  |  $I_x$  |  |  |  |  |  |  |  |  |  |  |  | 

Words: 0

Maximum marks: 5

- 3.4 An integer that is equal to the sum of all its *real factors*, including one (1) is called a **perfect number**.

Integer	Real factors	Sum	Perfect?
4	1, 2	$1 + 2 = 3$	No $3 \neq 4$
6	1, 2, 3,	$1 + 2 + 3 = 6$	Yes $6 = 6$
12	1, 2, 3, 4, 6	$1 + 2 + 3 + 4 + 6 = 16$	No $12 \neq 16$
28	1, 2, 4, 7, 14	$1 + 2 + 4 + 7 + 14 = 28$	Yes $28 = 28$

A *real factor* means a factor smaller than the number itself.

Study the Java code below:

```
public class PerfectNumbers {

    public static boolean perfect( int number ) {
        int factorSum = 1;
        for ( int divisor = 2; divisor <= number / 2; divisor++ ) {
            if ( number % divisor == 0 )
                factorSum += divisor;
        }
        return (factorSum == number);
    }
}
```

Write the necessary Java unit test(s), i.e. the test method(s), for the Java method above.

Fill in your answer here

Format
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Words: 0











Maximum marks: 5

3.5

Explain the difference(s) between **test execution tools** and **dynamic analysis tools** with respect to their purposes.

- What functions do they support?
- Who uses them?
- When are they used and what kind of defects might they discover?

Fill in your answer here

Format | **B** | *I* | U |  $x_2$  |  $x^2$  |  $I_x$  |  |  |  |  |  |  |  |  |  |  $\Sigma$  | ABC | 

Words: 0

Maximum marks: 5

**3.6** Explain the following terms:

- regression testing
- confirmation testing

**Fill in your answer here**

Format | **B** | *I* | U |  $x_2$  |  $x^2$  |  $I_x$  | | | | | | | | | | | ABC |

Words: 0

Maximum marks: 2

**4.1** *Note that in this task you can answer both in the text editor and with sketches/drawings. Use the sketching paper handed to you in the exam room. See instructions on your desk.*

A Music Academy has the following admission requirements:

- The applicant must have general academic qualifications.
- The applicant must have passed a practical music test.
- The applicant must have competition points above the year's minimum.

If all the requirements above are fulfilled, the applicant will be offered an ordinary study place.

However, if the applicant has general academic qualifications, but does not fulfill the second or third requirements above, the following actions will be taken:

- The applicant is placed on a waiting list if he or she has passed the practical music test but has competition points below the year's minimum.
- The applicant is offered a second chance to take the practical music test if he or she did not pass this test in the first place but has competition points above the year's minimum.

**a)** Draw a decision table that shows all the possible combinations of conditions for an applicant. The decision table shall include an action part that shows whether the applicant is offered a study place or is placed on a waiting list or is offered a second chance to pass the practical music test.

**b)** Reduce the number of rules as much as possible while still retaining all information. Explain how you made the reduction.

**c)** Consider the following three different test cases:

1. The applicant is academically qualified, has passed the practical music test, and has competition points above the year's minimum.
2. The applicant is academically qualified, has passed the practical music test, but has competition points below the year's minimum.
3. The applicant is academically qualified and has competition points above the year's minimum but did not pass the practical music test.

Do we need more test cases? If yes, specify the test case(s).

In order to obtain students with the best music abilities and skills, the Music Academy is, in special cases, willing to depart from the admission rules:

- If an applicant shows impressive music abilities and skills on the practical music test but lacks general academic qualifications, he or she may be offered a study place on the condition that general academic qualifications are acquired during the first year at the Music Academy.

**d)** How many different combinations of values of conditions will there be in the decision table if all conditions and combinations are included? How does the number of conditions affect the use of decision tables?

**Fill in your answer here**

Format | **B** | *I* | U |  $x_2$  |  $x^2$  |  $I_x$  | | | | | | |  $\Omega$  | | |  $\Sigma$  | ABC |

Words: 0

Maximum marks: 10

**4.2** *Note that in this task you can answer both in the text editor and with sketches/drawings. Use the sketching paper handed to you in the exam room. See instructions on your desk.*

A medical center will install a payment machine for patients to pay for their medical consultations. Before starting to use the payment machine, the center wants to perform some user tests that you will help design.

In the enclosed pdf document, you will find a state transition diagram that describes the payment machine as well as the interaction between the machine and the user.

*NB! You shall not judge whether the state transition diagram is correct or not but base your answers on it as it is.*

**a)** Based on the state transition diagram in the pdf document, you shall now set up a test case as a path (sequence of states) that describes *the main scenario*, i.e. a successful payment transaction.

- What is *the state coverage* of this test case?
- What is *the transition coverage* of this test case?

**b)** What is the highest *transition coverage* we can achieve in one single test case?

- What is *the state coverage* of this test case?
- What is *the transition coverage* of this test case?

**c)** How many test cases do we need to achieve 100% *transition coverage*?












- What is *the state coverage* of this test case?
- What is *the transition coverage* of this test case?

**d)** Find the *shortest path* from S0 to SX that visits *every state*.

- What is *the state coverage* of this test case?
- What is *the transition coverage* of this test case?

**e)** Why is 100% *state coverage* in most cases not enough as an *exit criterion* for testing?

**Fill in your answer here**

Format | **B** | *I* | U |  $x_2$  |  $x^2$  |  $I_x$  |  |  |  |  |  |  |  |  |  |  | ABC | 

Words: 0

Maximum marks: 10

5.1

Write a text describing potential benefits as well as risks of using tools that support testing.













- What are the benefits?
- What risks should we be aware of?

You should recognize that some tools have special considerations.

Explain the special considerations related to

- Test execution tools
- Performance testing tools
- Static analysis tools
- Test management tools

Fill in your answer here

Format | **B** | *I* | U |  $x_2$  |  $x^2$  |  $I_x$  |  |  |  |  |  |  |  |  |  |  |  | 

Words: 0

Maximum marks: 20

**Question 23**  
Attached

