Information

UNIVERSITY OF OSLO

The Faculty of Mathematics and Natural Sciences

Written examination IN3240/IN4240
2023 SPRING
Duration: 9 June at 09:00 - 13:00
Permitted aids: None.

It is important that you read this front page before you start. If you need to use the zoom function exam set you can hold down ctrl and click + or - on the numerical keyboard.

The task consists of four parts.

You can write in both English and Norwegian.

Part 1 - Multiple choice exercises

- 14 multiple choice questions
- Questions with one answer option: 1 point for the correct answer.
- Questions with more than one answer option, where it is only possible to choose a given number of answers: 1 point for each correct answer.
- Questions with more than one answer option, where it is possible to choose all the answer options: 1 point for a correct answer, -0.5 for a wrong answer.
- Matching questions: maximum 3 points.
- Maximum score for Part 1: 25 points.

Part 2 - Specification-Based Techniques

Three cases:

- EP / BVA: 5 points.
- Decision tables: 10 points.
- State transition: 10 points.
- Maximum score for Part 2: 25 points.

Part 3 - Short questions

- 5 text tasks to be answered briefly and accurately.
- Maximum score for each question: 5 points.
- Maximum score for Part 3: 25 points.

Part 4 - Essay

Maximum score for part 4: 25 points.

Drawings

Use the answer editor to create the necessary tables and any figures/drawings.

If some tasks are unclear, you can make your own assumptions. If so, explain them.

1 Part 1 - Multiple choice

Complete the sentence so that it gives the most precise definition of alpha testing.

Alpha testing is ...

Select one alternative:

- ... performed by an independent test team.
- ... performed by end users at their own site.
- ... performed by end users at the software developer's site.
- ... useful to test software developed for a specific customer or user.

Maximum marks: 1

2 Part 1 - Multiple choice

What is the purpose of confirmation testing?

Select one alternative:

- To confirm users' confidence that the system will meet their expectations and needs.
- To verify that no unintended defects have been introduced as a result of changes made.
- To confirm that the detailed logic of a component conforms to its specification.
- To confirm that a defect has been fixed correctly.

Maximum marks: 1

3 Part 1 - Multiple response

Which two of the following are NOT a review type, according to the ISTQB Glossary?

Select one or more alternatives:

- [ ] Examination
- [ ] Walkthrough
- [ ] Technical review
- [ ] Intrusion detection
- [ ] Inspection

Maximum marks: 2

4 Part 1- Matching / pairing

Match the column headings with the correct test level:

	User stories	Global design	Functional and non-functional requirements	Code
Integration testing	○	○	○	○
System testing	○	○	○	○
Unit testing	○	○	○	○
Acceptance testing	○	○	○	○

Maximum marks: 3

5 Part 1- Matching / pairing

Determine which test strategy is used in each of the cases.

Please match the values:

	Analytical	Model based	Consultative	Methodical
The tests are based on the views of business experts.	○	○	○	○
The tests are based on a state transition diagram of the product.	○	○	○	○
The tests are based on the systematic use of a predefined set of test conditions.	○	○	○	○
The tests are designed and prioritized based on risk level.	○	○	○	○

Maximum marks: 3

6 Part 1 - Multiple choice

How does *verification* differ from *validation* in the context of testing?

Select one alternative:

- They does not differ. Verification and validation mean the same thing in the context of testing.
- Verification is related to whether the program works according to its specifications and requirements, while validation is related to whether the program satisfies the needs of the users.
- Verification is related to 100% code coverage , while validation is related to 100% use-case coverage.
- Verification is related to to whether the program satisfies the needs of the users, while validation is related to whether the program works according to its specifications and requirements.

Maximum marks: 1

7 Part 1 - Multiple choice

Which of the following statements best describes White-box testing techniques?

Select one alternative:

- A procedure for deriving and/or selecting test cases based on an analysis of the internal structure of a component or a system.
- A procedure for deriving and/or selecting test cases based on testers' experience, knowledge and intuition.
- A procedure for deriving and/or selecting test cases based on an analysis of the specifications, either functional or non-functional, of a component or system without reference to its internal structure.
- A sequence of test cases in executive order, and any associated actions that may be required to set up the initial preconditions and any wrap-up activities post executions.

Maximum marks: 1

8 Part 1- Matching / pairing

Match the following processes with their corresponding activities:

	Transform the test objectives into test conditions	Establish the scope and objectives of the testing	Group tests into test scripts	Write a test summary report for the stakeholders
Test reporting	○	○	○	○
Test planning	○	○	○	○
Test implementation	○	○	○	○
Test analysis	○	○	○	○

Maximum marks: 3

9 Part 1 - Multiple choice

Which of the following statements best describes Black-box design techniques?

Select one alternative:

- A sequence of test cases in executive order, and any associated actions that may be required to set up the initial preconditions and any wrap-up activities post executions.
- A procedure for deriving and/or selecting test cases based on testers' experience, knowledge and intuition.
- A procedure for deriving and/or selecting test cases based on an analysis of the internal structure of a component or a system.
- A procedure for deriving and/or selecting test cases based on an analysis of the specifications, either functional or non-functional, of a component or system without reference to its internal structure.

Maximum marks: 1

10 Part 1 - Multiple response

Which of the following could be a coverage measure for state transition testing? Select one or more alternatives. (NB! -0.5 for incorrect answer)

- [ ] Number of states that have been reached.
- [ ] Specific sequences of transitions have been exercised.
- [ ] Number of transitions that have been exercised.
- [ ] The response time for each transaction.
- [ ] Number of boundaries have been exercised.

Maximum marks: 2

11 Part 1- Matching / pairing

Which of the following are benefits and which are risks of using tools to support testing?

	Benefit	Risk
Underestimating the effort required to maintain the test assets generated by the tool	○	○
Objective assessment	○	○
Over-reliance on the tool	○	○
Repetitive work is reduced	○	○
Unrealistic expectations	○	○
Ease of access to information about testing activities and test results	○	○
Greater consistency and repeatability	○	○

Maximum marks: 3

12 Part 1 - Multiple choice

Which of the following options best describes test-driven development (TDD)?

Select one alternative:

- TDD is a development methodology where the unit tests are written before the code to pass them is implemented.
- TDD is an agile development methodology where the end user tests the program for each iteration.
- TDD is another term for user-centered development.
- TDD is a development methodology where independent testers and developers work together in teams.

Maximum marks: 1

13 Part 1 - Multiple response

Static code analysis identifies all but two of the following problems. Which ones?

Select one or more alternatives:

- Variables that are declared, but never used
- Unreachable code
- Violations of programming standards
- Memory leaks
- Deviation between actual and expected output

Maximum marks: 2

14 Part 1 - Multiple choice

In ISTQB syllabus, the term "Impact Analysis" is linked to a specific type of testing. Which type?

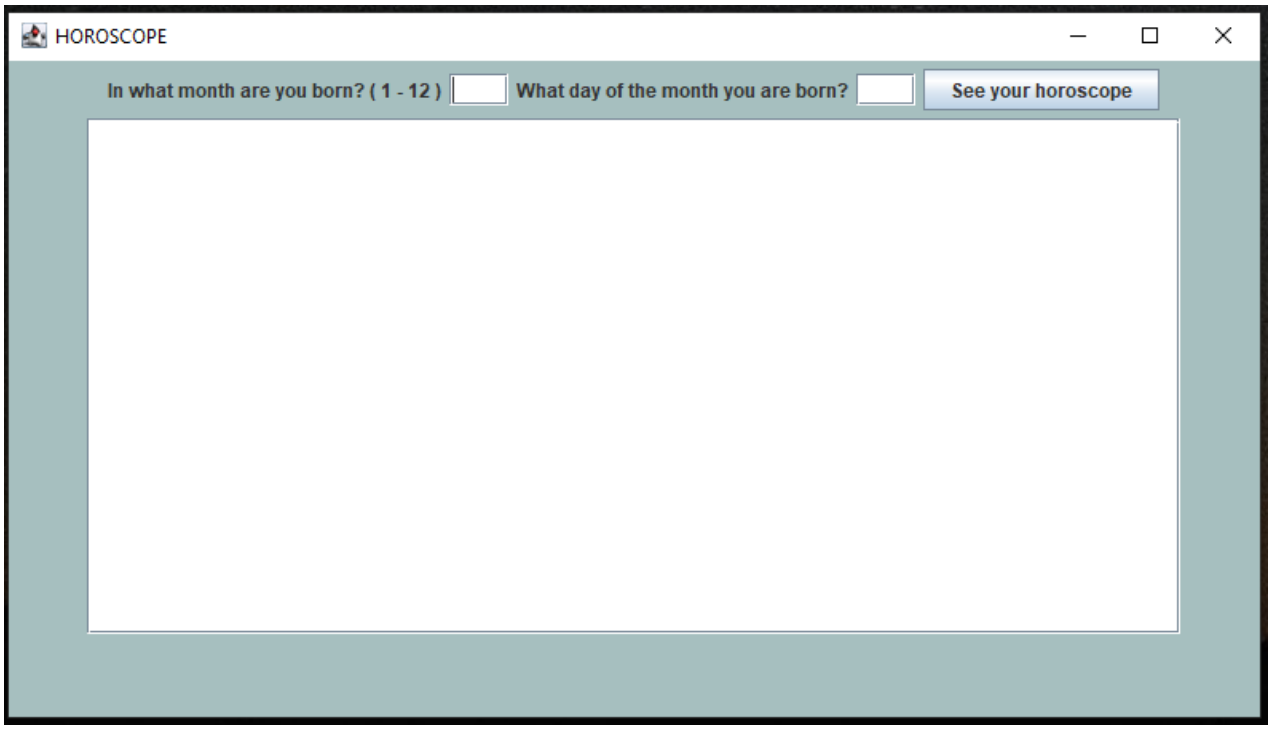
Select one alternative:

- Structured testing
- Functional testing
- Non-functional testing
- Regression testing

Maximum marks: 1

15 Part 2 - EP / BVA

In one of the weekly exercises related to exploratory testing, you were asked to test the following horoscope program:



The horoscope is based on the zodiac sign you were born in. In the picture below you can see the dates for the various zodiac signs:



When you are going to test the program at runtime without having access to the source code, it is important to choose test values in an efficient way. One way to do that is to use equivalence partitioning and boundary value analysis.

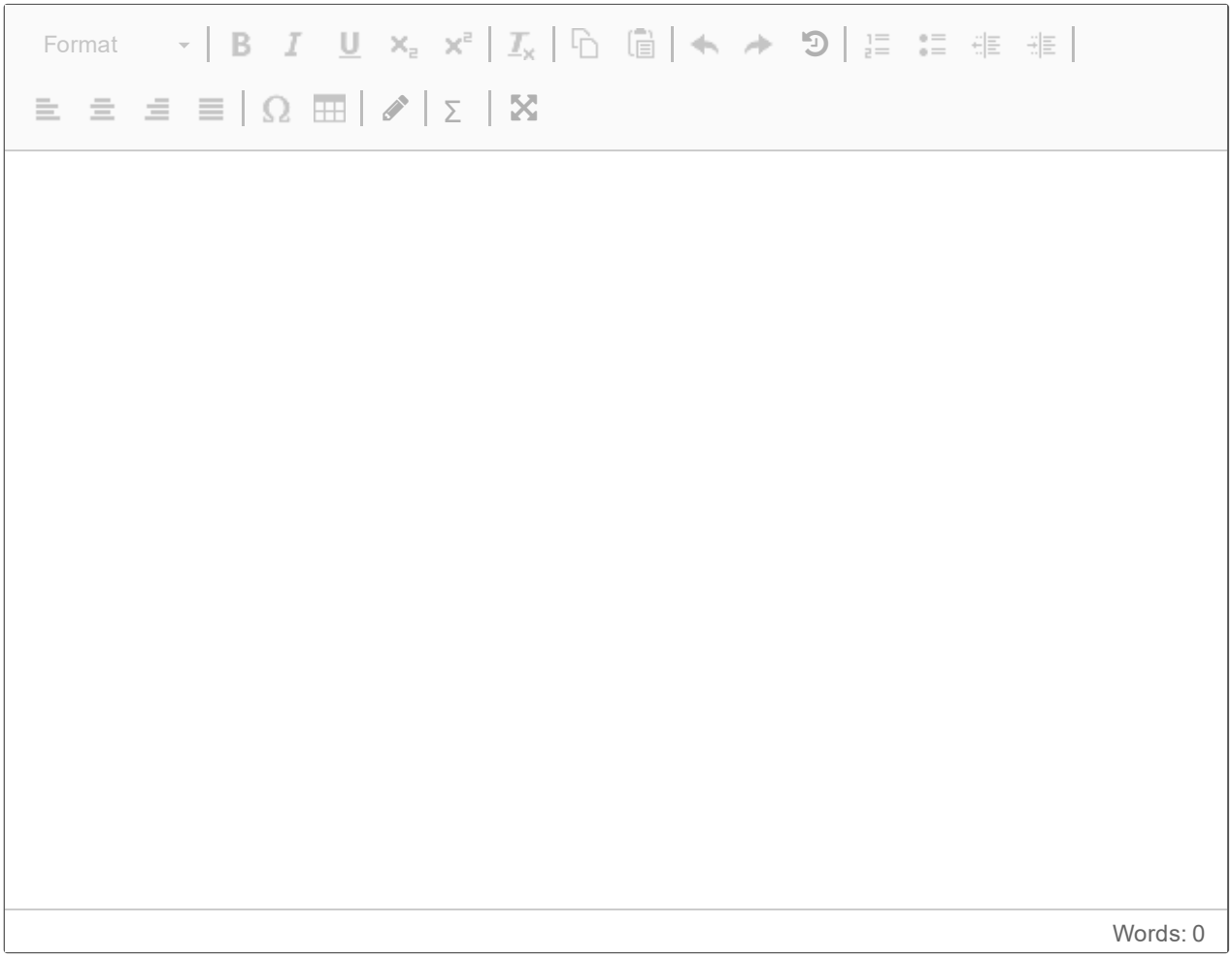
a) In this task, you can perform the equivalence partitioning in several ways, depending on what you focus on and how you choose to make the division. Describe at least two different ways the

input values can be divided into partitions.

b) Which condition must be met for the equivalence partitions to contain boundary values?

c) For each of the two equivalence partitionings you made in task a), you must stat any boundary values, both valid and invalid. As the number of boundary values can be very high, you do not need to list them all. The most important thing is that you describe them so that it is clear what they are.

Fill in your answer here



Maximum marks: 5

16 Part 2 - Decision tables

At a university in Norway, a separate master's program in "*Software testing*" has been created.

According to the admission criteria, applicants must satisfy the following requirements:

- The applicant must have a bachelor's degree in computer science.
- The applicant must have passed a course in *"Software testing"* of at least 10 credits.
- The applicant must have an average grade of C or better on the bachelor's degree.

Applicants who meet all of the requirements above will be offered a study place on the master's program in "*Software testing*". If an applicant does not meet the criteria, the answer the applicant receives will depend on which criterion is not met.

- Applicants without a bachelor's degree in computer science will be refused without further justification.
- If the applicant only lacks a 10 credit course in "Software Testing", but otherwise satisfies the requirements, the applicant is offered conditional admission, where he or she must take the missing course during the first semester of the Master's study. If not, the person will lose the study place.
- If the applicant has a bachelor's degree in computer science and a 10 credit course in "Software testing", but does not meet the grade requirement, he or she will be encouraged to apply again next year, after one or more grades have improved.
- If the applicant has a bachelor's degree in computer science, but has neither a 10 credit course in "Software testing" nor good enough grades, his or her application will be rejected.

In connection with the development and testing of a computer program that will process the applications automatically, you shall use decision tables to select the test cases to be run during the system testing of the program.

a) Draw a decision table that shows all possible combinations of requirement fulfillment in the application. The decision table must contain an action section that shows the outcome of the application, based on the points above.

b) Reduce the number of rules as much as possible without losing information. Explain how you did the reduction.

c) Consider the following three different test cases:

1. The applicant has a bachelor degree in Computer Science with an average grade of C or better, and 10 credit course in "Software testing".
2. The applicant has a bachelor's degree in computer science and the required 10 credit course in "Software testing", but the average grade on the bachelor's degree is too low.
3. The applicant has a bachelor's degree in computer science with an average grade of C or better, but lacks the required 10 credit course in "Software testing".

Do we need more test cases? If yes, specify the test case(s) and which rule(s) in the decision table they represent.

d) If it turns out that the number of applicants for the master study in "Software testing" will be higher than the department has capacity for, the management will consider adding a new requirement for next year's admissions: Only applicants with an approved plan for the master's

thesis will be offered a place. How many different combinations of requirement fulfillment do you get in the decision table if you incorporate this requirement?

e) Decision tables are considered a test design tool. However, they are suitable for more than designing test cases. In what other forms of testing are decision tables a good aid, and where in the development cycle does this form of testing take place?

Fill in your answer here

Format

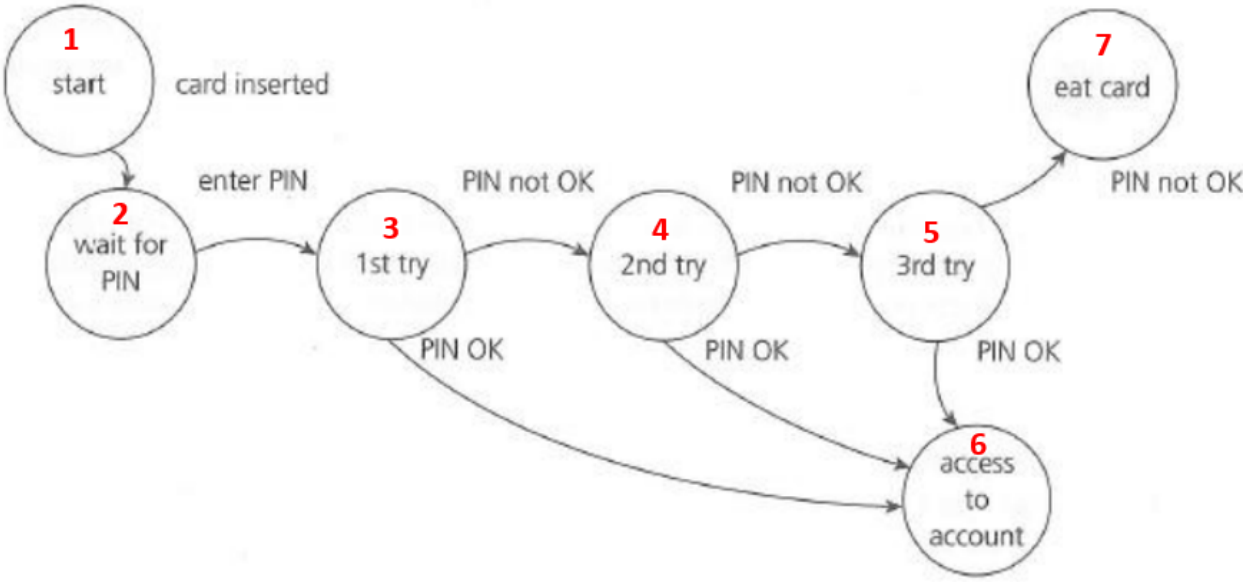
Words: 0

Maximum marks: 10

17 Part 2 - State transition

State transition testing is based on what in mathematics is called a finite state machine, where the behavior of a program is described as a state transition diagram.

In the textbook we find the following example of a finite state machine, where the use of an ATM is described as a state transition diagram:



A test case can be described as a path (a sequence of states) through the state transition diagram, where we follow the arrows from state to state.

Study the following test cases:

1. The customer inserts the bank card, enters the correct pin code and gains access to the bank account.
2. The customer inserts the bank card, enters a wrong pin code the first time, then enters the correct PIN and accesses the bank account.
3. The customer inserts the bank card, enters the wrong pin code three times in a row so that the ATM "eats" the card.

a) Describe each of the test cases above as a path through the state transition diagram. (Use the red numbers in the circles to indicate the states.)

b) Which test case provides the highest state coverage, and what is the degree of coverage?

c) Which test case provides the highest transition coverage, and what is the degree of coverage?

d) Is it possible to achieve 100% state coverage and/or 100% transition coverage with only one test case? Justify the answers.

e) What is the state coverage and the transition coverage for the three test cases together, respectively?

f) Which test case(s) do you need to add to achieve 100% transition coverage? Describe the test case(s) both in words and as path(s) through the state transition diagram.

g) Which type of coverage, state coverage or transitional coverage, is the strongest? Is there any connection between them, and if so, which one?

Fill in your answer here

Format

Words: 0

Maximum marks: 10

18 Part 3 - Short question

In the textbook, chapter 6, one of the sub-chapters is devoted to special considerations and challenges related to the use of test management tools and test execution tools.
What should we pay particular attention to before using these types of tools?

Fill in your answer here

Format

Words: 0

Maximum marks: 5

19 Part 3- Short question

In the second compulsory assignment, you tested a ticket machine. This type of machine must be able to be used by all types of people of all ages. The field of Human Computer Interaction, HCI, has developed a framework that we can rely on to achieve this. Which five points should you be aware of when designing the user interface for the ticket machine? (We are not interested in the levels of the framework, but only in the points describing the purpose of HCI testing.)

Fill in your answer here

Format

Words: 0

Maximum marks: 5

20 Part 3 - Short question

Name and briefly describe the various phases of the fundamental testing process. Place the phases in sequential order.

Fill in your answer here

Format

Words: 0

Maximum marks: 5

21 Part 3 - Short questions

1. Briefly explain the difference between a test condition and a test case.
Illustrate the difference with a concrete example.

2. Describe what is included in a test case.
Illustrate with a concrete example.

Fill in your answer here

Format

Words: 0

Maximum marks: 5

22 Part 3 - Short question

STQB distinguishes between different types of testing based on their purpose.

Which four test types do we have according to ISTQB's definitions, and what is the purpose of each type?

Fill in your answer here

Format

Words: 0

Maximum marks: 5

23 Part 4 - Essay

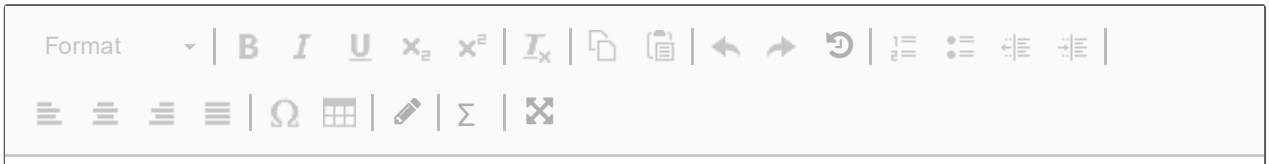
The psychology of testing

In this task, you will write a text about the psychological aspects related to testing and development work.

In the text, you must answer the questions below. However, you are free to include other points that you think are relevant to the problem.

- What is the main difference between the mindset of a developer and a tester, and what is the reason for this difference?
- Why is it important for a tester to have good social and communication skills?
- What other personal qualities should a tester have? Describe at least three other characteristics.
- Sometimes challenges arise in the relationship between developer and tester. What is the cause?
- How can the tester communicate errors, omissions and other negative information to the developer in the best possible way?
- What are the advantages and disadvantages of independent testing?
- Describe at least four different levels of test independence.
- Independent testing is used to varying degrees at the four test levels. Which degrees of test independence are best suited at the various test levels? Rank the four test levels from most suitable to least suitable in terms of testing carried out by an independent testing team.

Fill in your answer here



Words: 0

Maximum marks: 25