Introduction

Written home exam in IN3240/IN4240
2021 Spring
Duration: 2 June, 9:00 AM to 1:00 PM

It is important that you read this cover page carefully before you start.

General information:
• Important messages during the exam are given directly from the course teacher on the course's semester page. It is therefore important that you update and check the course's semester page regularly during the exam period.

• Your answer should reflect your own independent work and should be a result of your own learning and work effort.

• All sources of information are allowed for written home exams. If you reproduce a text from books, online articles, etc., a reference to these sources must be provided to avoid suspicions of plagiarism. This also applies if a text is translated from other languages.

• You are responsible for ensuring that your exam answers are not available to others during the exam period, neither physically nor digitally.

• Remember that your exam answers must be anonymous; do not state either your name or that of fellow students.

• If you want to withdraw from the exam, press the hamburger menu at the top right of Inspera and select "Withdraw".

Collaboration during the exam:
It is not allowed to collaborate or communicate with others during the exam. Cooperation and communication will be considered as attempted cheating. A plagiarism control is performed on all submitted exams where text similarities between answers are checked. If you use notes that have been prepared in collaboration with others before the exam, this might be detected in a plagiarism control. Such text similarities will be considered an attempt at cheating.

Cheats:
Read about what is considered cheating on UiO's website.

Contact information: User support exam or Eva Hadler Vihovde +4792888788

The assignment consists of five parts.
The first part is this introduction, while you shall answer the next four parts.
You may write both English and Norwegian.

Part 2 - Multiple Choice

- 16 multiple choice questions
- Questions with one answer option: 1 point for correct answer
- Questions with more than one answer alternative: 1 point for each correct answer
- Matching questions: 1, 2 or 3 points

- Maximum score for part 2: 25 points

Part 3 - Black-box techniques

- Three cases
- 10 points for correct solution of each case
- Maximum score for part 3: 30 points

Part 4 - Text questions

- 5 text assignments to be answered briefly and accurately.
- Maximum score for each question: 5 points
- Maximum score for part 4: 25 points.

Part 5 - Essay

- Maximum score for part 5: 20 points

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

Sketching
If you need to add a drawing or upload a pdf file as an attachment to one of the exercises, you can do so at the end of the last part, after the essay. Check out how to submit digital hand drawings.

1 Multiple choice

Which of the following test activities is the strongest candidate for automation?

Select one alternative:

- Regression testing
- Beta testing
- Confirmation testing
- Usability testing

Maximum marks: 1

2 Multiple choice

The black-box design techniques can be used in several of the areas below. However, you should match them so that all the techniques are applied to the most suitable area.

	Use case testing	State transition testing	Decision table	EP and BVA*
Testing an access control system based on several binary conditions	○	○	○	○
Testing the interest rate return on a savings account	○	○	○	○
Testing the functionality of a ticket machine	○	○	○	○
Testing the user interaction in a Graphical User Interface	○	○	○	○

** EP and BVA: Equivalence partitioning and boundary value analysis*

Maximum marks: 3

3 Multiple choice

In context of Software testing, the concept of *risk* is a product of two factors. Which ones?

Select one or more alternatives:

- ☐ Impact
- ☐ Likelihood
- ☐ Budget
- ☐ Management
- ☐ Quality assurance

Maximum marks: 2

4 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

5 Multiple choice

Which of these describes a *function* test?

Select one alternative:

- Checking the effect of high volumes of traffic in a call-center system
- Checking how easy it is to use the software system
- Counting if the number of outputs is as expected
- Measuring how long it takes to upload a file to a cloud-based solution

Maximum marks: 1

6 Multiple choice

Which of these basic approaches to a software development project follows the key elements of user centric design process?

Select one alternative:

- Interview users, develop the software, and perform acceptance test
- Iteratively develop prototypes, perform expert reviews, and integrate found issues
- Define requirements, develop the software, and perform acceptance test
- Interview users, iteratively develop prototypes, and evaluate the software

Maximum marks: 1

7 Multiple choice

Which two of the following are typical activities for a test leader?

Select one or more alternatives:

- Acquire and prepares test data
- Evaluate test results against exit criteria
- Gather and report test progress metrics
- Develop system requirements, design specifications and design models
- Handle all test automation duties

Maximum marks: 2

8 Multiple choice

According to the ISTQB Glossary, which of the following is NOT a test type?

Select one alternative:

- Functional testing
- Component testing
- Change-related testing
- White-box testing

Maximum marks: 1

9 Multiple choice

Which of these is NOT a *non-functional* quality characteristic?

Select one alternative:

- Usability
- Portability
- Security
- Performance
- Maintainability

Maximum marks: 1

10 Multiple choice

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

Select one or more alternatives:

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

Maximum marks: 2

11 Multiple choice

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

Select one or more alternatives:

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

Maximum marks: 2

12 Multiple Choice

Which of the following statements best describes White-box testing 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 an analysis of the specifications, either functional or non-functional, of a component or system without reference to its internal structure.
- 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.

Maximum marks: 1

13 Multiple choice

Which two of the following are typical activities for a tester?

Select one or more alternatives:

- Develop system requirements, design specifications and design models
- Handle all test automation duties
- Acquire and prepares test data
- Gather and report test progress metrics
- Evaluate test results against exit criteria

Maximum marks: 2

14 Multiple choice

Match each testing level with the corresponding test basis:

	System testing	Acceptance testing	Component testing	Integration testing
Program specifications and requirements	○	○	○	○
User stories	○	○	○	○
System architecture	○	○	○	○
Programming code	○	○	○	○

Maximum marks: 3

15 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 an analysis of the specifications, either functional or non-functional, of a component or system without reference to its internal structure.
- 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.

Maximum marks: 1

16 Multiple choice

Which of the following terms is related to White-box testing?

Select one alternative:

- Code coverage
- Regression testing
- Configuration
- Accuracy

Maximum marks: 1

17 Decision table

The Oslo City Council has decided to develop a new software system for calculating tolls related to the toll ring around Oslo. In addition to solving queue problems during rush hour, the new prices aim to reduce the amount of air pollution in the city. *NB! In this exercise, we have specifically chosen to disregard buses and lorries.*

- The rush hour is defined as the time period from 07:30 to 09:30, and later from 15:30 to 17:30.
- Electric vehicles are not charged outside rush hour, but pay a fee of 10 NOK during rush hour.
- Non-electric vehicles (i.e. petrol- and diesel vehicles) are required to pay 50 NOK outside rush hour, and 80 NOK during rush hour.
- Vehicles with passengers, both electric and non-electric, receive a 50% discount regardless of the time of day.

a)
Set up a decision table that contains all conceivable combinations of binary conditions. The table shall contain an action part where the toll prices belonging to each binary combination are stated.

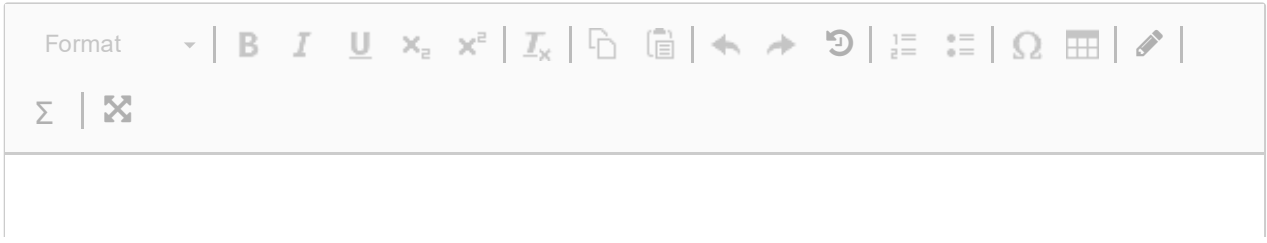
b)
Reduce the number of rules by simplifying (rationalizing) the decision table, without losing any calculations. Explain why you are making the simplification.

c)
Consider the following four different test cases:

1. El-car in the rush hour with passenger
2. El-car outside the rush hour without passenger
3. Diesel car in the rush hour with passenger
4. Petrol car outside the rush hour without passenger

Do we need more test cases to cover the business rules in the decision table?
If yes, specify the test case(s).

Fill in your answer here



Words: 0

Maximum marks: 10

18 EP-BVA

The Black-box technique *Equivalence partitioning (EP)* is based on the mathematical concept of *equivalence partitions*, also called *equivalence classes*. If a group of subsets are to be described as equivalence partitions and thus form a partition of a larger set, there are some conditions that must be met.

a) Which conditions must be met to call a group of subsets equivalence partitions that thus form a partition of a larger set?

b) What is the relationship between the actions of the program and the elements of the individual equivalence partitions?

c) Given a partitioning of a set, e.g. a set of input values to a program.
What characteristic must the set have for the equivalence partitions to contain boundary values?

In the previous task, we looked at a software system for calculating tolls related to the toll ring around Oslo. Imagine that we now expand the problem so that we, in addition to electric and non-electric cars, allow buses and lorries to pass the toll ring and that the different types of vehicles are paying different tolls.

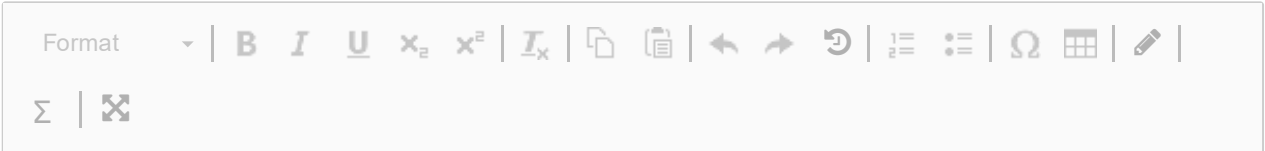
d) One of the input values of this program is the type of vehicle passing the toll ring.
How would you use the *Equivalence partitioning* and possibly *Boundary Value Analysis* to select input values for the test cases to achieve the highest possible test coverage with the least number of tests?

- Determine the different partitions
- Determine if the partitions have boundary values, and if so, determine them.

e) Another input value that goes into the calculation of the toll is the time of passage.
How would you use the *Equivalence partitioning* and possibly *Boundary Value Analysis* to select input values (times of passage) for the test cases to achieve the highest possible test coverage with the least number of tests?

- Determine the different partitions
- Determine if the partitions have boundary values, and if so, determine them.

Fill in your answer here



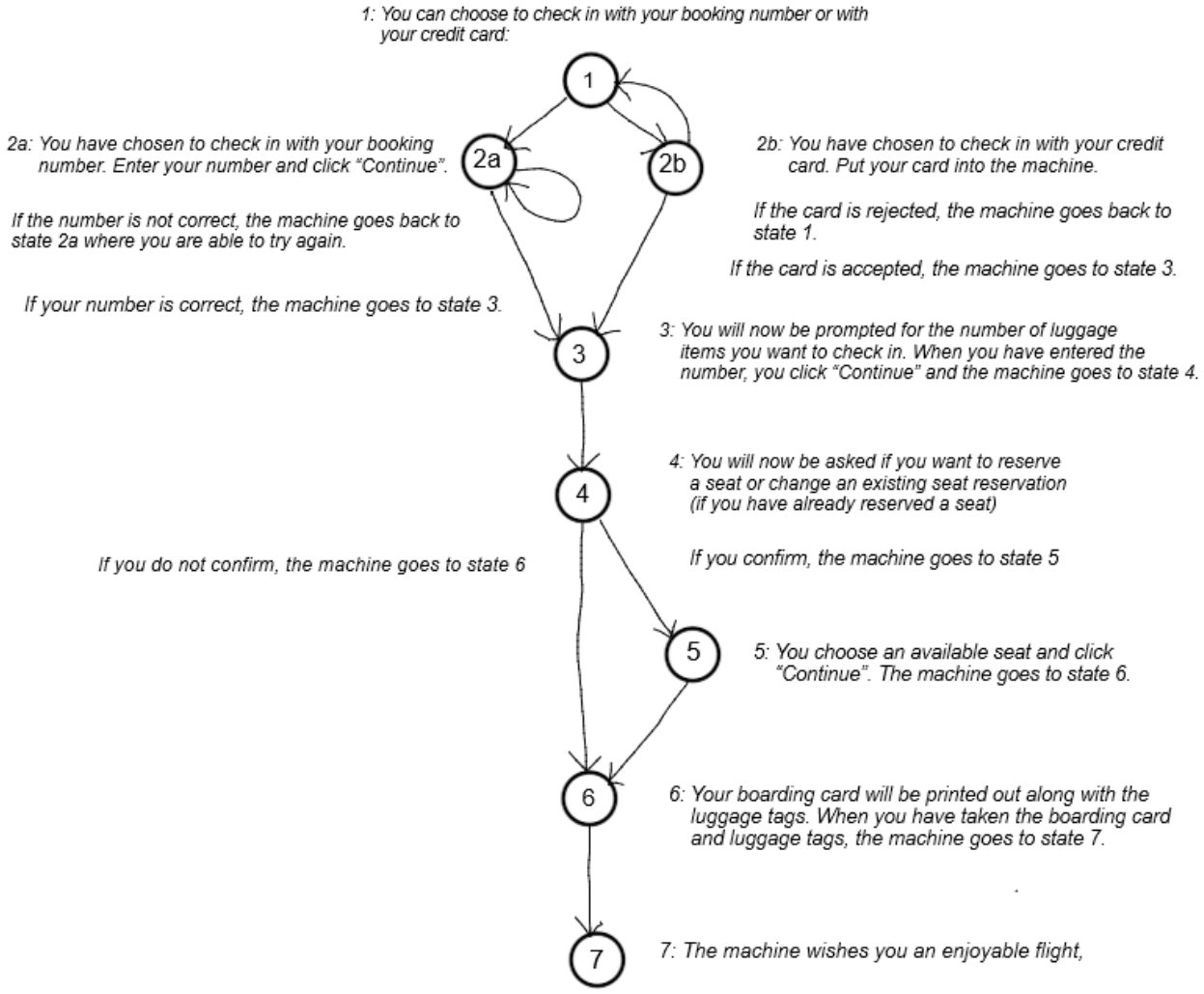
Words: 0

Maximum marks: 10

19 State transition diagram

In the enclosed pdf document and in the picture below you will find a state transition diagram that describes a check-in machine at an airport, 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.



To simplify the task, we have chosen to ignore the Cancel button which brings you back to state 1, no matter what state you are in.

a) Find the shortest path through the diagram that visits every state. Use arrows between the states to display the transitions in the path.

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

b) Determine the path that has the highest transition coverage.

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

c) How many test cases do we need to achieve 100% transition coverage?
Justify your answer and write down the test case(s) as on or more paths.

d) Regardless of the case, if you have 100% transition coverage, how much state coverage do you then have?

Fill in your answer here

Format

Words: 0

Maximum marks: 10

20 Exercise

Be precise when answering the questions, but avoid answering with single words. You are not allowed to copy anything from the textbook, slides or other resources. Use your own words.

Explain the main difference between static and dynamic testing techniques. Where and when in the development process are they used? Is it sufficient to choose only one of the techniques, or should we choose both? Justify the answers.

Fill in your answer here

Format

Words: 0

Maximum marks: 5

21 Exercise

Be precise when answering the questions, but avoid answering with single words. You are not allowed to copy anything from the textbook, slides or other resources. Use your own words.

Define and explain the purpose of entry and exit criteria in software testing.
In which phase(s) of the testing process are the entry and exit criteria determined?
Who is responsible for them?
Where and when are they checked and by whom?

Fill in your answer here

Format

Words: 0

Maximum marks: 5

22 Exercise

Be precise when answering the questions, but avoid answering with single words. You are not allowed to copy anything from the textbook, slides or other resources. Use your own words.

Despite the fact that Test Automation plays an important role in software testing, many tests are still performed manually.

The degree of test automation varies at the different testing levels.
Assess cost - benefit from automated versus manual testing on

- Component testing level
- Integration testing level
- System testing level
- Acceptance testing level

Fill in your answer here

Format

Words: 0

Maximum marks: 5

23 Exercise

Be precise when answering the questions, but avoid answering with single words. You are not allowed to copy anything from the textbook, slides or other resources. Use your own words.

Explain the term *exploratory testing*. What is this test technique based on? Under what circumstances would it be wise to choose exploratory testing as a test strategy?

Fill in your answer here

Format

Words: 0

Maximum marks: 5

24 Exercise

Be precise when answering the questions, but avoid answering with single words. You are not allowed to copy anything from the textbook, slides or other resources. Use your own words.

Explain the concept of *personas* in the context of user-centered development. Give an example of a *persona* and describe how it can increase the accessibility and usability of an application under development.

Fill in your answer here

Format

Words: 0

Maximum marks: 5

25 Essay

You are not permitted to copy anything from the textbook, slides or other resources.

Imagine that you are participating in a student project where you are to develop a software application during one semester. You are a total of 4 developers in the team, and all of you will act as both developers and testers.

Which test activities, both manual and automated, would it be wise to integrate in the development process to get the best possible test coverage and thereby also ensure the best possible product quality, based on the resources available?

To the extent possible, you should justify the choice of test activities, test strategies and approaches using the seven testing principles established by ISTQB.

Fill in your answer here

Format

Words: 0

Maximum marks: 20

26 Attachment

If you need to supplement some of the tasks with a drawing or a pdf file, you can do it here.

Upload your file here. Maximum one file.

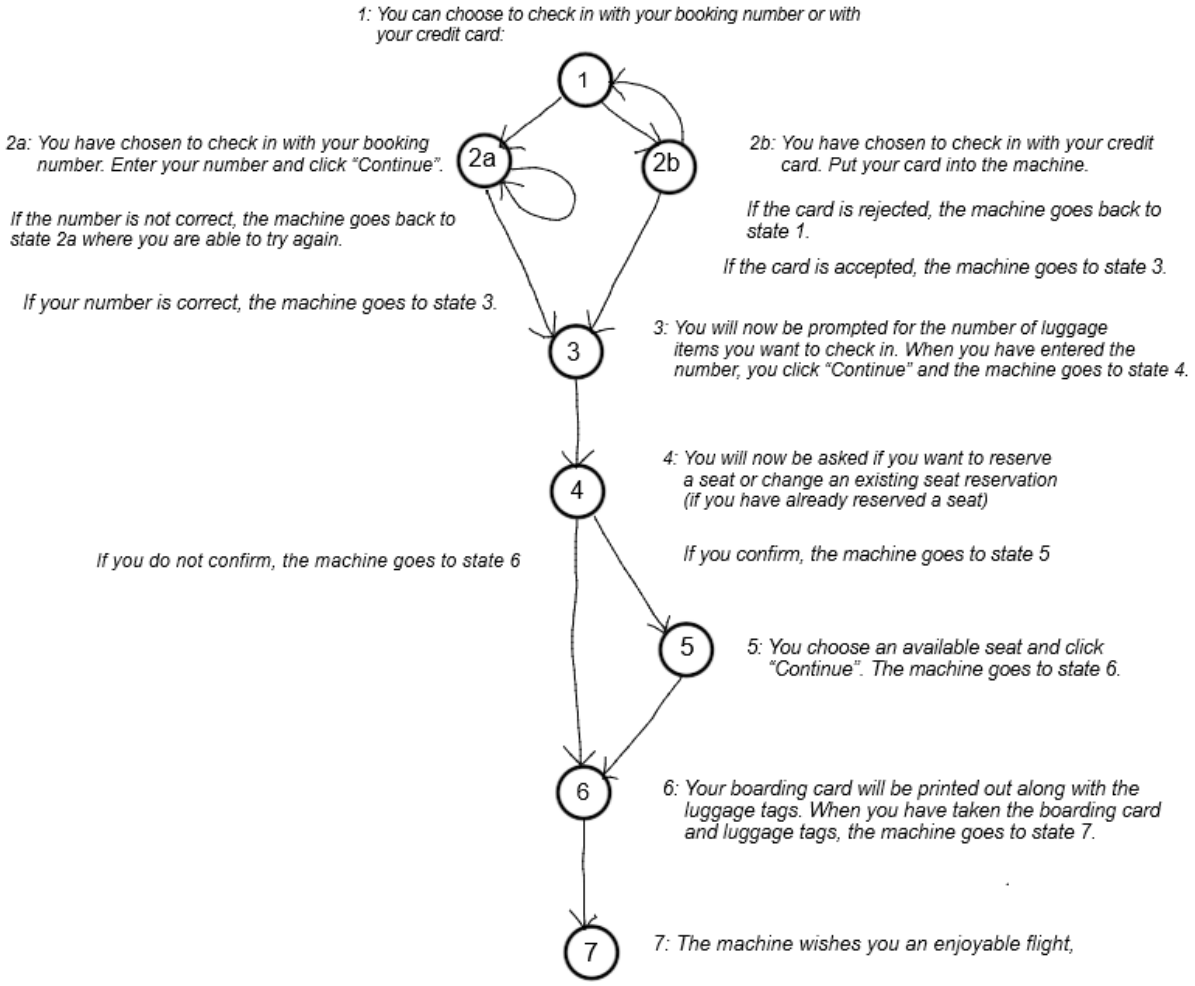
All file types are allowed. Maximum file size is **2 GB**

Select file to upload

Maximum marks: 0

Question 19
Attached

State transition diagram of a check-in machine



To simplify the task, we have chosen to ignore the Cancel button which brings you back to state 1, no matter what state you are in.