Test design: Part II

Software Testing: INF3121 / INF4121

Summary: Week 5

Specification-based testing (black-box)

Equivalence partitioning | Boundary value analysis

Decision table | State transition | Use case testing

Structure-based testing (white-box)

Statement / Decision testing and coverage

Experience-based testing

Choosing test technique

Part I: Close-ended questions

Question 1

Which of the following would structure-based test design techniques be likely to be applied to?

1. Boundaries between mortgage interest rate bands
2. An invalid transition between two different arrears statuses
3. The business process flow for mortgage approval
4. Control flow of the program to calculate repayment

a. 2, 3 and 4
b. 2 and 4
c. 3 and 4
d. 1, 2 and 3

Question 2

Use case testing is useful for which of the following?

1. Designing acceptance tests with users or customers
2. Making sure the mainstream business processes are tested
3. Finding defects in the interaction between components
4. Identifying the maximum and minimum values for every input field
5. Identifying the percentage of statements exercised by a set of tests

a. 1, 2 and 3
b. 2, 4 and 5
c. 1, 2 and 4
d. 3, 4 and 5

Question 3

Which of the following statements about the relationship between statement and decision coverage is correct?

a. 100 % decision coverage is achieved if statement coverage is greater than 90 %
b. 100 % statement coverage is achieved if decision coverage is greater than 90 %
c. 100 % decision coverage always means 100 % statement coverage
d. 100 % statement coverage always means 100 % decision coverage

Question 4

Why are error guessing and exploratory testing techniques good to do?

a. They find defects missed by specification-based and structure-based techniques
b. They don’t require any training to be as effective as formal techniques
c. They can be used more effectively when there are good specifications
d. They will ensure that all of the code or system is tested

Question 5

How do experience-based techniques differ from specification-based techniques?

a. They depend on the tester's understanding of the way the system is structured rather than on a documented record of what the system should do
b. They depend on having older testers rather than younger testers
c. They depend on a documented record of what the system should do rather than on an individual's personal view
d. They depend on an individual's personal view rather than on a documented record of what the system should do

Question 6

Pair the following test design techniques with the typical problems they address:

Decision tables	Applied when the inputs or outputs can be grouped in a way that exhibits similar behaviour
Use case testing	Used to test sequences of states or sequences of transitions
State transition testing	Used when the problem can be described as an interaction between an actor and the system
Boundary value analysis	Used when the inputs and actions can be expressed as Boolean values
Equivalence partitioning	Applied when the inputs and outputs can be grouped in equivalent partitions. The technique tests the edges of each equivalence partition

Question 7

If you are flying with an economy ticket, there is a possibility that you may get upgraded to business class, especially if you hold a gold card in the airline's frequent flyer program.

If you don't hold a gold card, there is a possibility that you will get "bumped" off the flight if it is full and you check in late.

This is shown in the following figure. Note that each box (i.e. statement) has been numbered.

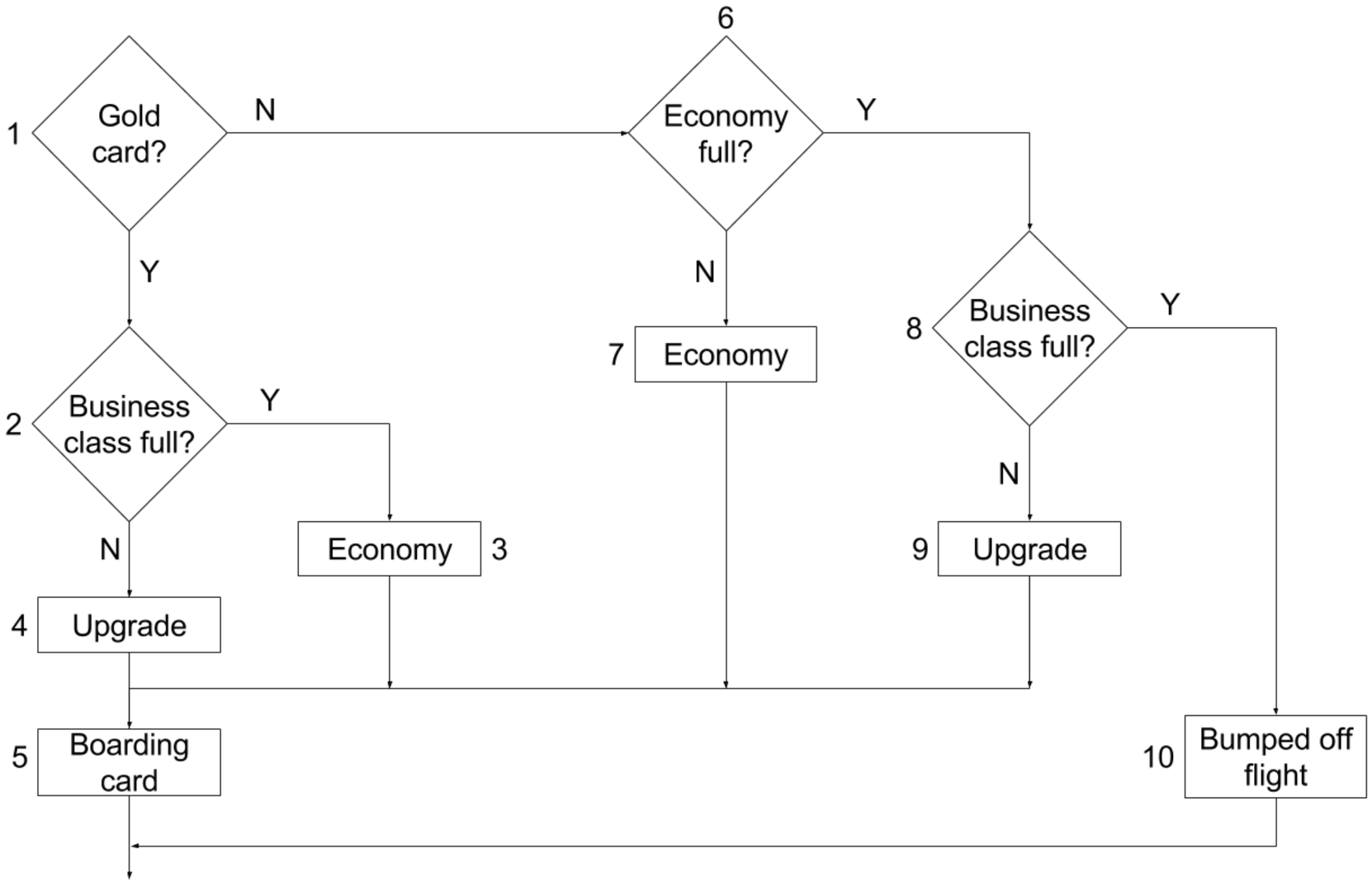
Question 7

Tests run:

Test 1
Gold card holder who gets upgraded to business class

Test 2
Non-gold card holder who stays in economy

Test 3
A person who is bumped off the flight



Question 7

What is the statement coverage of these three tests?

a. 60 %
b. 70 %
c. 80 %
d. 90 %

Question 8

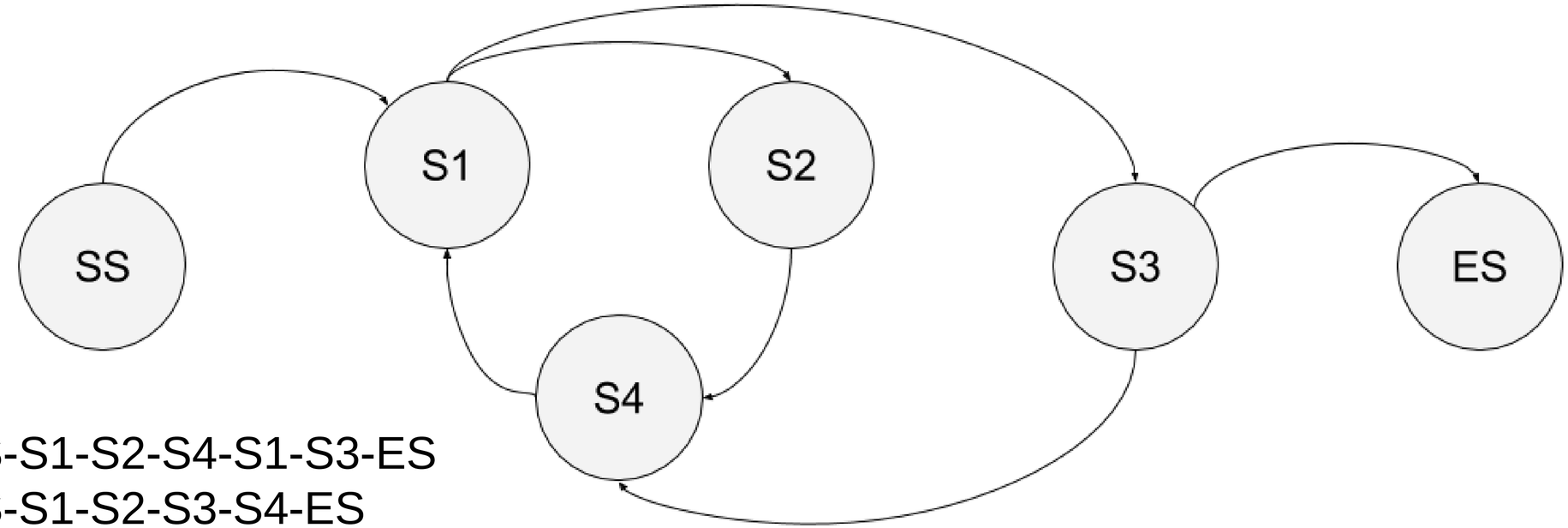
When choosing which technique to use in a given situation, which factors should be taken into account?

1. Previous experience of types of defects found in this or similar system
2. The existing knowledge of the testers
3. Regulatory standards that apply
4. The type of test executing tool that will be used
5. The documentation available
6. Previous experience in the development language

a. 2, 3, 5, and 6
b. 1, 2, 3 and 5
c. 1, 4 and 5
d. 2, 3 and 5

Question 9

Given the state diagram below, which test case is the minimum series of valid transitions to cover every state?



a. SS-S1-S2-S4-S1-S3-ES
b. SS-S1-S2-S3-S4-ES
c. SS-S1-S2-S4-S1-S3-S4-S1-S3-ES
d. SS-S1-S4-S2-S1-S3-ES

Part II: Exercises and Open-ended questions

Exercise 1: Decision Table Testing

If you hold an "over 60s" rail card, you get a 34% discount on whatever ticket you buy. If you are travelling with a child (under 16) you get a 50% discount on any ticket if you hold a family rail card, otherwise you get a 10% discount. You may only hold one type of rail card.

a. Produce a decision table showing all combinations of fare types and resulting discounts
b. Derive test cases from the decision table

Exercise 2: State Transitions

A website shopping basket starts out empty. As purchases are selected, they are added to the shopping basket. Items can also be removed from the shopping basket.
When the customer decides to check out, a summary of the items in the basket and the total cost are show. Customer states if the information is OK.
If the contents and the price are OK, then you leave the summary display and go to the payment system. Otherwise, you go back to shopping (so as to remove items if you want).

a. (i)Produce a state diagram showing the different states and transitions.
   (ii)Define a test, in terms of a sequence of states, to cover all transitions
b. Produce a state table. Give an example test for an invalid transition

Exercise 2(a.i): State Transitions

Produce a state diagram showing different states and transitions

Exercise 2(a.ii): State Transitions

Define a test, in terms of a sequence of states, to cover all transitions

Exercise 2(b): State Transitions

Produce a state table. Give an example test for an invalid transition

Exercise 3: Statement and Decision

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 (added if required).

Ten it asks if you want sugar (added if required)

Finally, the drink is dispensed.

Exercise 3(a)

Draw a control flow diagram for this example

Hint: Regard the selection of the type of drink as one statement

Exercise 3(b)

Given the following tests, what is the statement coverage achieved? What is the decision coverage achieved?

Test 1: Cold drink
Test 2: Hot drink with milk and sugar

Exercise 3(c)

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

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