Test Management: Part I

Software Testing: IN3240 / IN 4240

Summary

Test organisation

Independence | Tasks of the test leader and testers

Test planning and estimation

Activities | Entry and exit criteria | Estimation | Strategy and approach

Test progress monitoring and control

Configuration and management

Risk and testing

Part I: Close-ended questions

Independent Testing

Question 1

Why is independent testing important?

a. Independent testing is usually cheaper than testing your own work
b. Independent testing is more effective at finding defects
c. Independent testers should determine the processes and methodologies used
d. Independent testers are dispassionate about whether the project succeeds or fails

Question 1: Clues

Why is independent testing important?

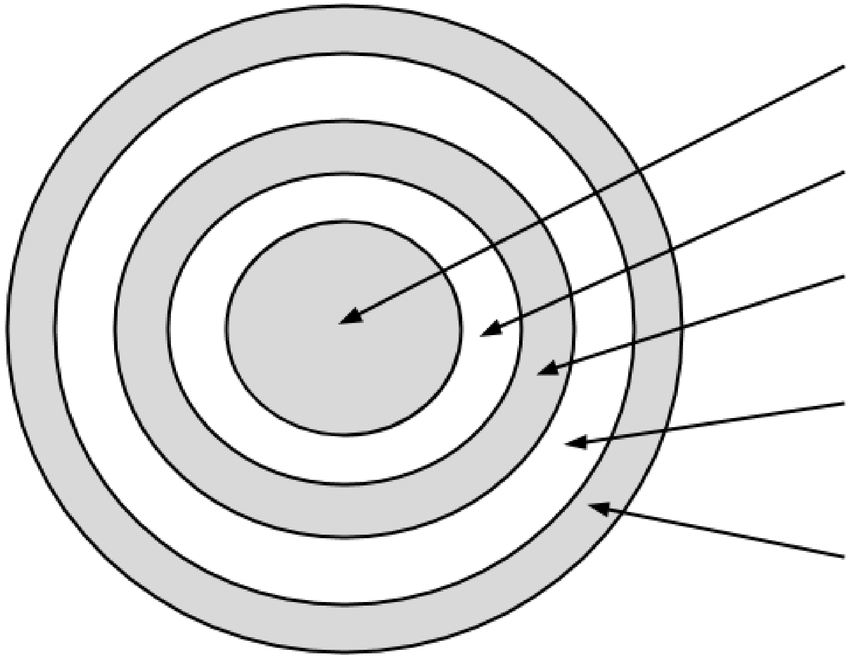
- Testing software and developing (building) software are not the same
  - Different tasks involved
  - Require different mindsets from testers and developers
- Testing is an assessment of quality
  - Assessments are not always positive
- Separate the testers from the developers
  - Improve defect finding by using independent testers
  - Avoid author bias → Objective assessments

Question 1: Clues

Why is independent testing important?

Options for independence

Independence is not either or, but a continuum



1. No independent testers. Developers test own code.
2. Independent testers within development teams.
3. Independent test team / group within organisation report to project management.
4. Independent testers from business or user community.
5. Independent test specialists for specific test targets such as usability testers, security testers or certification testers.

Question 1: Answer

Why is independent testing important?

a. Independent testing is usually cheaper than testing your own work
b. Independent testing is more effective at finding defects
c. Independent testers should determine the processes and methodologies used
d. Independent testers are dispassionate about whether the project succeeds or fails

Question 2

Which of the following is an advantage of independent testing?

a. Independent testers don't have to spend time communicating with the project team
b. Programmers can stop worrying about the quality of their work and focus on producing more code
c. The others on the project can pressure the independent testers to accelerate testing at the end of the test schedule
d. Independent testers sometimes question the assumptions behind the requirements, design and implementations

Question 2: Clues

Which of the following is an advantage of independent testing?

- Benefits of independent testing
  - Independent testers can often see more, other, different defects
    - Compared to testers working within the programming team
  - Bring a different set of assumptions to testing / reviews
    - Expose hidden defects / problems
    - Not affected by business analysts, designers, programmers, etc.
  - Sceptical attitude
  - Professional pessimism

Question 2: Clues

Which of the following is an advantage of independent testing?

- Benefits of independent testing
  - Independent test teams may enjoy more credibility in an organisation
    - Compared to a test leader who is part of the programming team
  - Can report test results honestly and without concern
    - Distanced from co-workers (programmers/managers) responsible for the defects
  - Often have separate budgets
    - Facilitates to ensure proper level of spending on testing resources
    - Training, test tools, equipment, etc.

Question 2: Clues

Which of the following is an advantage of independent testing?

Risks of independent testing

Testers / test team can become isolated

Interpersonal isolation from programmers, designers, project team

Isolation from the broader view of quality and business objectives

Obsessive focus on defect finding

Refusal to accept business prioritisation of defects

Communication problems

Lack of identification with the project goals

Question 2: Clues

Which of the following is an advantage of independent testing?

- Risks of independent testing
  - Developers may abdicate their responsibility for quality
    - “Why bother unit testing when we already have a test team?”
  - Focus only on pointing out flaws / defects
    - Provide little (or no) solutions
  - Failure to understand the tester’s role
    - Should provide a *service* to the project team
    - Goal is not to dictate how things should be done

Question 2: Answer

Which of the following is an advantage of independent testing?

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Testing Roles and Tasks

Question 3

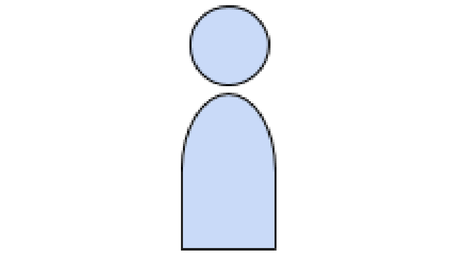
According to the ISTQB glossary, what do we mean when we call someone a test manager?

a. A test manager manages a collection of test leaders
b. A test manager is the leader of a test team or teams
c. A test manager gets paid more than a test leader
d. A test manager reports to a test leader

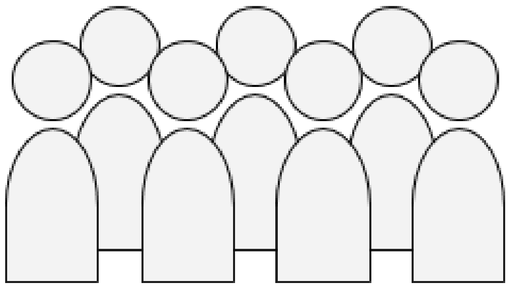
Question 3: Clues

According to the ISTQB glossary, what do we mean when we call someone a test manager?

Roles within a test team



Test Leader
(manager / coordinator)



Testers

Test manager

Plans / Monitors / Controls the testing activities and tasks

Leader of a test team

Question 3: Answer

According to the ISTQB glossary, what do we mean when we call someone a test manager?

a. A test manager manages a collection of test leaders
b. A test manager is the leader of a test team or teams
c. A test manager gets paid more than a test leader
d. A test manager reports to a test leader

Question 4

Which of the following is among the typical tasks of a test leader?

a. Develop system requirements, design specifications and usage models
b. Handle all test automation duties
c. Keep test cases and coverage hidden from programmers
d. Gather and report test progress metrics

Question 4: Clues

Which of the following is among the typical tasks of a test leader?

Coordination

Devise test strategy and plan with project managers

Planning the tests

Understand the test objectives

Select test approaches

Estimate time, effort, and cost of testing

Define test levels

Plan incident management

Plan and Control

Analysis and Design

Implementation and Execution

Evaluation of Exit Criteria and Reporting

Test Closure Activities

Question 4: Clues

Which of the following is among the typical tasks of a test leader?

Manage test configuration

- Set up adequate configuration management
- Testware for traceability

Introduce metrics

- For measuring test progress
- Evaluating the quality of the testing and product

Automation of tests

- Decide what to automate

Plan and Control

Analysis and Design

Implementation and Execution

Evaluation of Exit Criteria and Reporting

Test Closure Activities

Question 4: Clues

Which of the following is among the typical tasks of a test leader?

- Test specifications, preparation and execution
  - Initiate specification / preparation / implementation / execution
  - Monitor test results
  - Check exit criteria
- Adapt planning
  - Based on test results and progress



Question 4: Answer

Which of the following is among the typical tasks of a test leader?

a. Develop system requirements, design specifications and usage models
b. Handle all test automation duties
c. Keep test cases and coverage hidden from programmers
d. Gather and report test progress metrics

Question 5

According to the ISTQB Glossary, what is a test level?

a. A group of test activities that are organised together
b. One or more test design specification documents
c. A test type
d. An ISTQB certification

Question 5: Clues

According to the ISQTB Glossary, what is a test level?

Test level

"A group of test activities that are organised and managed together"

Four test levels

Component testing / Integration testing / System testing / Acceptance testing

Purpose of test levels

Include different methodologies that can be used when conducting the test effort

Has clear, level-specific, pre-defined objectives

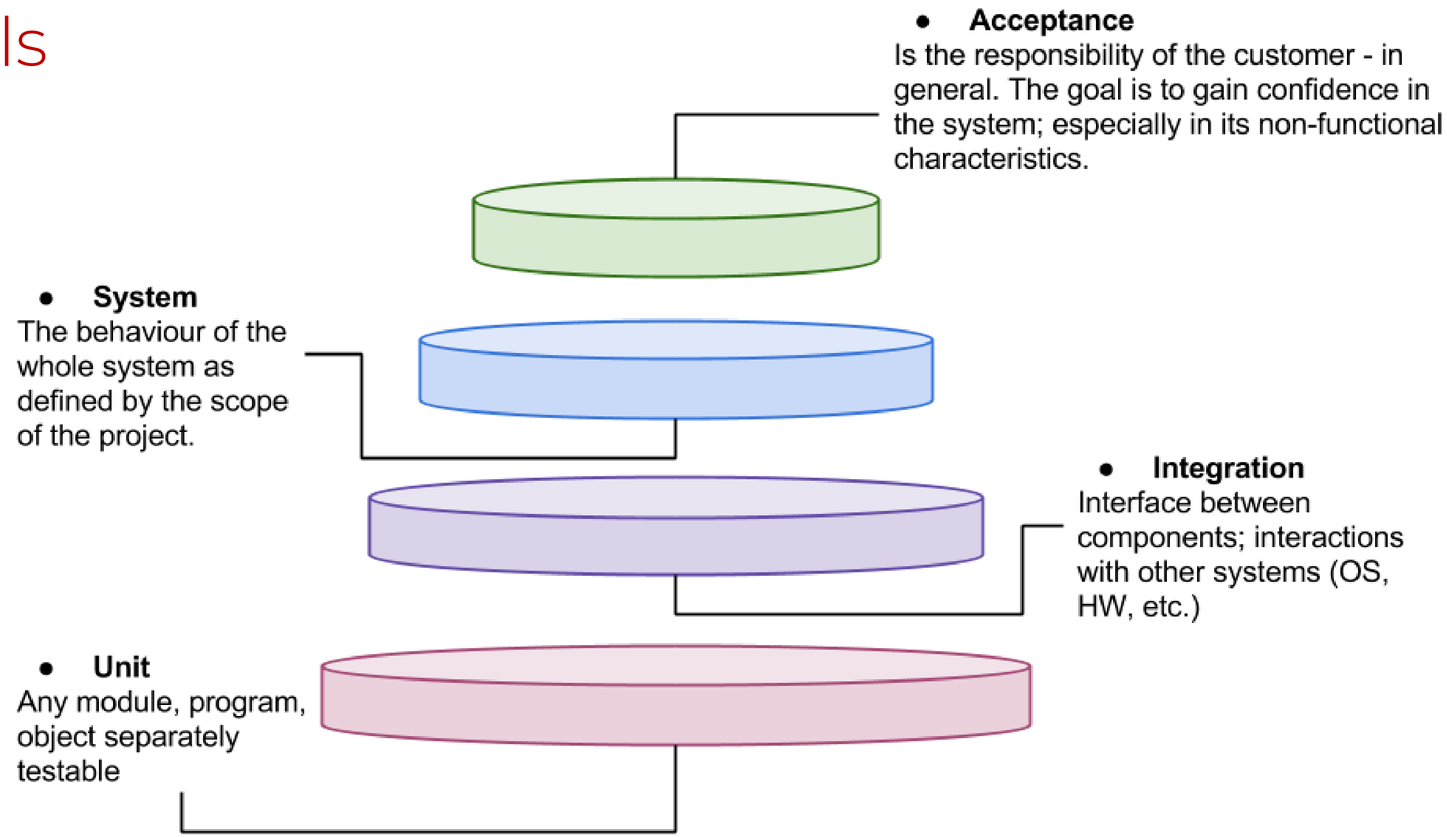
Different test types may be performed at different levels

Linked to the responsibilities in a project

Question 5: Clues

According to the ISQTB Glossary, what is a test level?

Test levels



Question 5: Answer

According to the ISQTB Glossary, what is a test level?

a. A group of test activities that are organised together
b. One or more test design specification documents
c. A test type
d. An ISTQB certification

Test Planning and Documents

Question 6

A test plan is written specifically to describe a level of testing where the primary goal is establishing confidence in the system. Which of the following is a likely name for the document?

a. Master test plan
b. System test plan
c. Acceptance test plan
d. Project test plan

Question 6: Clues

Which of the following is a likely name for the document where the goal is establishing confidence in the system?

- Test plan → Project plan for the testing work to be conducted
  - Elaborates on the challenges that await the test effort
  - Highlights important topics
  - Serve to communicate all aspects of the test effort
    - Project team, testers, peers, managers, other stakeholders
  - Helps to manage change
    - Revise test plans as we gather more information
  - Serves as documentation

Question 6: Clues

Which of the following is a likely name for the document where the goal is establishing confidence in the system?

Considerations for writing a test plan

- What is within the scope of the test effort, and what is outside the scope?
- What are the constraints affecting the test effort?
  - E.g. budget limitations, time constraints, etc.
- What are the test objectives?
- What are the important project and product risks?
- Which aspects of the product are more (or less) testable?
- What should be the overall test execution schedule?

Question 6: Clues

Which of the following is a likely name for the document where the goal is establishing confidence in the system?

Test plan documentation

Master test plan

Overall plan for the test effort

Level-specific test plans

Plans specifically aimed at each test level

Aims to adhere to the objectives of that level

Central question: What is the purpose of this test level?

The test plan seeks to facilitate the realisation of these objectives

Question 6: Answer

A test plan is written specifically to describe a level of testing where the primary goal is establishing confidence in the system. Which of the following is a likely name for the document?

a. Master test plan
b. System test plan
c. Acceptance test plan
d. Project test plan

Question 7

What is the primary difference between a test plan, test design specification, and test procedure specification?

a. The test plan describes one or more levels of testing, the test design specification identifies the associated high-level test cases and a test procedure specification describes the actions for executing a test
b. The test plan is for managers, the test design specification is for programmers and the test procedure specification is for the testers who are automating the tests
c. The test plan is the least thorough, the test procedure specification is the most through and the test design specification is midway between the two
d. The test plan is finished in the first third of the project, the test design specification is finished in the middle third of the project and the test procedure specification is finished in the last third of the project

Question 7: Clues

What is the primary difference between a test plan, test design specification, and test procedure specification?

- Before executing a test → Need to know what we are trying to test
  - Inputs / Expected outcomes
  - How to get ready and run the actual tests
- Artefacts for testing → Each specified in its own document (IEEE 829)
  - Test conditions
  - Test cases
  - Test procedures

Question 7: Clues

What is the primary difference between a test plan, test design specification, and test procedure specification?

- Test conditions → Test Design Specification
  - Condition: Something that can be tested
  - Approach: “Throw the net wide”
    - Identify as many conditions as possible
    - Exhaustive testing is impossible → Select a subset of all possible tests
  - Examples
    - Measuring branch coverage → Test basis is the code itself
    - Requirements specification → Table of contents can be the list of test conditions

Question 7: Clues

What is the primary difference between a test plan, test design specification, and test procedure specification?

[IEEE 829: Test Design Specification Template]

Test design specification identifier

Unique name / Version date and number / Author and contact information / Revision history

Features to be tested

Features / Appropriate level of testing / Reference to original documentation

Approach refinements

Selection of test technique / Methods for analysis / Relationship between test items and level of testing

Test identification

Identification of each test case / procedure

Feature Pass/Fail Criteria

Describe criteria for assessing the feature / Whether tests were successful or not

Question 7: Clues

What is the primary difference between a test plan, test design specification, and test procedure specification?

Test cases → Test Case Specification

Case: Set of input values, preconditions, expected results

Developed for a particular objective or test condition

Can cover a number of test conditions

E.g. Age, gender, enough credit?, place of birth, etc.

Objective

To assess that the system does what it is supposed to do

Given the conditions, does it behave correctly?

Question 7: Clues

What is the primary difference between a test plan, test design specification, and test procedure specification?

[IEEE 829: Test Case Specification Template]

- Test case specification identifier
  - Unique name / Version date and number / Author and contact information / Revision history
- Test items
  - Requirements specification / System and detail design specification / Users guide / Operations manual / etc.
- Input and Output specifications
  - Data (values, ranges, sets) / Tables / Human actions / Conditions (states) / Files / Relationships
- Environmental needs
- Special procedural requirements
- Intercase dependencies
  - Any prerequisite test cases

Question 7: Clues

What is the primary difference between a test plan, test design specification, and test procedure specification?

- Test procedures → Test Procedure Specification
  - Procedure: Sequence of actions for the execution of a test
  - Test script
  - Manual test script
- Formed into a test execution schedule
  - Description of the order of the test procedures
  - By whom do the tests need to be run?
  - Useful for prioritising tests → Ensure best testing is done in the time available

Question 7: Clues

What is the primary difference between a test plan, test design specification, and test procedure specification?

[IEEE 829: Test Procedure Specification Template]

Test procedure specification identifier

Unique name / Version date and number / Author and contact information / Revision history

Purpose

List all test cases covered by the procedure / Description of the procedure

Special requirements

Manual or automated / Stages in which the test is to be used (pre-testing, regression, etc.)

Test environment / Skills required / Prerequisite procedures

Steps

Log / Setup / Start / Proceed / Measure / Shutdown / Restart / Stop / Wrap-up

Contingencies

Question 7: Answer

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Entry and Exit Criteria

Question 8

Entry criteria for testing means that the company management gave their OK to the development team to start the test activities

a. True
b. False

Question 8: Clues

Entry criteria

- Defines when to start testing
- Central question: Do we have enough to conduct a meaningful test effort?

Typical considerations

- Test environment availability and readiness
- Test tool readiness in the test environment
- Testable code availability
- Test data availability

Question 8: Answer

Entry criteria for testing means that the company management gave their OK to the development team to start the test activities

a. True
b. False

Question 9

The ISTQB Foundation Syllabus established a fundamental test process where test planning occurs early in the project, while test execution occurs later. Which of the following elements of the test plan, while specified during test planning, are assessed during test execution?

a. Test tasks
b. Environmental needs
c. Exit criteria
d. Test team training

Question 9: Clues

Which of the following elements of a test plan, while specified during test planning, are assessed during test execution?

Purpose of testing

Verify some aspect of the system / Reveal faults in the implementation

What do we define *prior* to test execution?

Test tasks: What is to be done and when?

Environmental needs: What requirements do we have for the test environment?

Entry and exit criteria: When to start and when to end the test effort?

Question 9: Clues

Which of the following elements of a test plan, while specified during test planning, are assessed during test execution?

What do we assess *during* to test execution?

The results of the test against the pre-defined objectives

We are interested in answering the following questions

How did the test go?

Did it go according to plan? Why, why not?

Do we need to run more tests?

Question 9: Clues

Which of the following elements of a test plan, while specified during test planning, are assessed during test execution?

- Exit criteria → When to stop testing? (Definition of *enough*)
- Typical considerations
  - Thoroughness measures: Code coverage / Functionality coverage /Risk
  - Estimates: Defect density / Reliability measures
  - Cost
  - Residual risk: Defects not fixed / Lack of test coverage in some areas
  - Schedule: Time to market

Question 9: Answer

The ISTQB Foundation Syllabus established a fundamental test process where test planning occurs early in the project, while test execution occurs later. Which of the following elements of the test plan, while specified during test planning, are assessed during test execution?

a. Test tasks
b. Environmental needs
c. Exit criteria
d. Test team training

Question 10

Consider the following exit criteria which might be found in a test plan. Which of these belong in an acceptance test plan?

1. No known customer-critical defects
2. All interfaces between components tested
3. 100 % code coverage of all items
4. All specified requirements satisfied
5. System functionality matches legacy system for all business rules

a. All statements belong in an acceptance test plan
b. Only statement 1 belongs in an acceptance test plan
c. Only statements 1, 2 and 5 belong in an acceptance test plan
d. Only statements 1, 4 and 5 belong in an acceptance test plan

Question 10: Clues

Which of the given exit criteria belong in an acceptance test plan?

- Acceptance testing
  - Validation testing with respect to the users
  - Requirements, business processes
- Typically assesses aspects such as
  - The system's adherence to the requirements specification
  - Defects that may be critical to the customer
  - Functionality in accordance with the business rules?
  - Whether or not the system is *fit for use*

Question 10: Answer

Consider the following exit criteria which might be found in a test plan. Which of these belong in an acceptance test plan?

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Question 11

During test execution, the test manager describes the following situation to the project team:

- 90 % of the test cases have been run.
- 20 % of the test cases have identified defects.
- 110 defects have been found.
- 100 defects have been fixed and have passed confirmation testing.
- Of the remaining 10 defects, project management has decided that they do not need to be fixed prior to release.

Question 11

Which of the following is the most reasonable interpretation of this test status report?

a. The remaining 10 defects should be confirmation tested prior to release
b. The remaining 10 % of test cases should be run prior to release
c. The system is ready for release with no further testing or development effort
d. The programmers should focus their attention on fixing the remaining known defects prior to release

Question 11: Answer

Which of the following is the most reasonable interpretation of this test status report?

a. The remaining 10 defects should be confirmation tested prior to release
b. The remaining 10 % of test cases should be run prior to release
c. The system is ready for release with no further testing or development effort
d. The programmers should focus their attention on fixing the remaining known defects prior to release

Question 12

The purpose of _____ criteria is to define when to stop testing, such as at the end of a test level or when a set of tests has a specific goal.

Question 12: Answer

The purpose of _____ criteria is to define when to stop testing, such as at the end of a test level or when a set of tests has a specific goal.

EXIT (criteria)

Question 13

The metrics for test progress monitoring can be collected both manually and automatically

a. True
b. False

Question 13: Clues

The metrics for test progress monitoring can be collected both manually and automatically

- Test progress monitoring
  - Provide feedback on how the test effort is going
  - Visible information about the test results
  - Measure the status of testing
  - Gathering data to be used for future estimation of test effort
- IEEE 829: Test Log Template

Question 13: Answer

The metrics for test progress monitoring can be collected both manually and automatically

a. True
b. False

Question 14

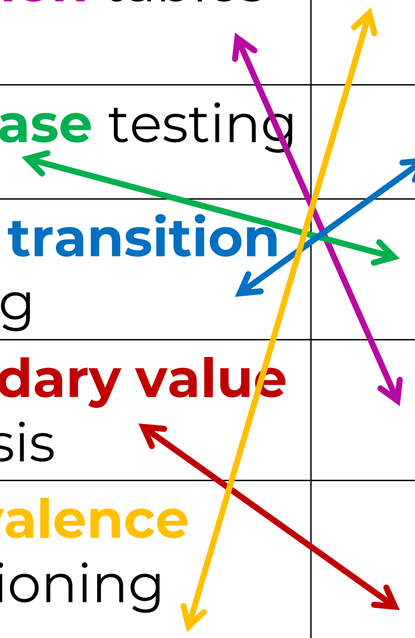
Pair the following test design techniques with the typical problems they address:

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 14: Answer

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



Part II: Exercises and Open-ended questions

Exercise 1

Describe briefly what is meant by the following test approaches (strategies)

a. Analytical approach
b. Model-based approach
c. Methodical approach
d. Process- or standard-compliant approach
e. Dynamic and heuristic approach
f. Consultative approach
g. Regression-averse approach

Is one approach better than the other? Why, why not? Which do you prefer?

Exercise 1(a): Answer

Analytical approach

- Use of formal / informal analytical technique
  - Factors strongly affecting the testing environment
- Risk-based strategy
  - Perform risk analysis using project documents and stakeholder input
  - Planning, estimation, designing, and prioritising tests based on risk
- Requirements-based strategy
  - Analysis of the requirements specification
  - Basis for planning, estimation, design

Exercise 1(b): Answer

Model-based approach

- Tests designed based on models of the object functionality
  - Critical system behaviour
- Emphasis on identification and selection of the appropriate model
  - Preventive test approach
- Example
  - Can build mathematical models for loading/response for e-commerce servers
  - Design tests based on the models
  - Check if behaviour of the system conforms to the predicted behaviour (from model)

Exercise 1(c): Answer

Methodical approach

Adhere to a pre-planned, systematised approach

Developed in-house, assembled from various concepts

Following a specific method

Tests are designed, executed and implemented in accordance

Examples

Adherence to certain checklists

Failure-based (error checking, fault-attacks)

Experience-based

Exercise 1(d): Answer

Process- or standard-compliant approach

- "*Go by the book*" as opposed to "*do it your own way*"
- Uses externally developed industry standards
  - Design and implement test assets based on these
  - Little (or no) customisation
- Examples
  - Adhering to IEEE 829 standards
  - Adhering to agile methodologies
    - E.g. Extreme programming (XP)

Exercise 1(e): Answer

Dynamic and heuristic approach

- Heuristic (techniques)
  - Approach to problem solving that employs a practical methods
  - Not guaranteed to be optimal, but sufficient for intermediate goals
  - Typically applied during the later stages of testing
- Problem: Exhaustive testing is impossible
  - Solution: Finding as many defects as possible
- Examples
  - Exploratory testing

Exercise 1(f): Answer

Consultative approach

- Rely on a group of non-testers to guide / perform test effort
- Seek advice and guidance from externals
  - Business domain experts
  - Technical experts (e.g. security experts)
  - Outside the test team
- Examples
  - Asking users for what to test
  - Asking developers to develop the tests

Exercise 1(g): Answer

Regression-averse approach

- Techniques to manage the risk of regression
- Goal: Avoid (re-)occurrence of defects
  - Create effective regression tests to run when anything changes
  - Re-run every test to ensure nothing has been broken
- Practices
  - Automating functional tests prior to release / Re-use existing test material
- Example
  - Having a standard set of test data for which a screen needs to pass

Exercise 1: Answer

Is one approach better than the other? Why, why not?

- Some strategies are preventive (prior)
  - Analytical test strategies involve upfront analysis of the problem area
  - Tend to identify test basis prior to test execution
- Some strategies are reactive (during)
  - Dynamic test strategies focus on the test execution period
  - Enable the identification of defect (clusters) that may be hard to anticipate
- Strategies complement each other
  - *Testing is context-dependent*: There is no *best way* to test

Exercise 1: Answer

Factors to consider when choosing test strategies

Risks

Testing is about risk-management

Consider the risks and level of risk

Well-established applications that evolve slowly → Regression is an important risk

Skills

Strategies must not only be chosen → They must also be executed

Consider which skills the test team possesses / lacks

Standard-compliant strategy can make up for lack of skill within a test team

Exercise 1: Answer

Factors to consider when choosing test strategies

Objectives

Testing must satisfy the needs of the stakeholders to be successful

Example

If the objective is to find as many defects as possible, with limited resources

Dynamic testing may prove beneficial

Regulations

Sometimes you must satisfy not only to stakeholder, but also to existing regulations

Devise a methodical test strategy that adheres to these regulations

Exercise 1: Answer

Factors to consider when choosing test strategies

Product

- Some products tend to have well-specified requirements
  - E.g. weapons and contract-development systems
- Synergy with a requirements-based analytical strategy

Business

- Business considerations and continuity are important
- Example: Model-based approach
  - When you can use a legacy system as a model for a new system

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