Static techniques

Software Testing: IN3240 / IN4240

Summary

Static techniques and the test process

What is static analysis / testing?

Review types

Informal review / Walkthrough / Technical review / Inspection

Varying degree of formality

Static analysis by tools

Typical defects detected

Part I: Close-ended questions

Question 1

Which of the following artefacts can be examined by using review techniques?

a. Software code
b. Requirements specification
c. Test designs
d. All of the above

Question 1: Clues

Which of the following artefacts can be examined by using review techniques?

- Review process
  - Process / Meeting → Examine software products
  - From very formal (structured + regulated) to informal (no written instructions)
  - Objectives
    - Find defects → Defects detected earlier are usually cheaper to remove
    - Gain understanding → Find omissions in requirements / specifications
    - Discussion / Decision-making

Question 1: Clues

Which of the following artefacts can be examined by using review techniques?

Any software product can be reviewed

- Requirements specification
- Design specification
- Source code
- Test plans / specifications / cases / scripts
- Product manuals / User guides
- Web pages

Question 2

A static analysis tool gives quality information about the code without executing it.

a. True
b. False

Question 2: Clues

A static analysis tool gives quality information about the code without executing it.

Static analysis

- Examination of code without executing it
  - E.g. through compiling code
- Understanding code structures / dependencies
- May help to ensure code adheres to industry standards

Tools for static analysis

- Manual examination of work product
- Automated tools to assist in examination

Question 3

Which is not a type of review?

a. Walkthrough
b. Inspection
c. Informal review
d. Management approval

Question 3: Clues

Which is not a type of review?

Types of reviews

Informal review

Inexpensive way to get some benefit

Walkthrough

Learning / Gaining understanding / Defect finding

Technical review

Discussion / Decision-making / Defect-finding / Solving technical problems / Check conformance

Inspection

Finding defects

Question 4

Which statement about reviews is true?

a. Inspections are led by a facilitator or moderator, whereas technical reviews are not necessarily.
b. Technical reviews are led by a trained leader, inspections are not
c. In a walkthrough, the author does not attend
d. Participants for a walkthrough always need to be thoroughly trained

Question 4: Clues

Which statement about reviews is true?

Reviews vary in degree of formality

Defines …

Content and focus area of review meeting

Roles present during review

Responsibilities of each participant

Level of documentation / effort based on formality



Question 4: Clues

Which statement about reviews is true?

Informal review

- Pair programming
- Technical lead → Reviews the design / code
- No formal process
- Documentation optional

Walkthrough

- Led by author
- Open-ended sessions → Scenarios / Dry runs / Peer group
- In practice: Varies from very informal to very formal

Question 4: Clues

Which **statement** about **reviews** is **true**?

Technical review

- Peer review without management participation
- *Ideally* led by a facilitator or moderator
- Documented → Defined defect-detection process
- Peers and technical experts present during review meeting
- Requires pre-meeting preparations
- Optional use of
  - Checklists / Review reports / List of findings
  - Management may participate

Question 4: Clues

Which statement about reviews is true?

Inspection

Peer examination

Always led by facilitator or moderator (not author)

Formal process → Checklists / Rules / Entry and exit criteria

Includes metrics

Pre-meeting preparations required

Defined roles

Produce and follows inspection report / list of findings

Formal follow-up process

Question 5

What is the main difference between a walkthrough and an inspection?

a. An inspection is led by authors, whilst a review is led by a trained facilitator or moderator
b. An inspection has a trained leader, whilst a walkthrough has no leader.
c. Authors are not present during inspections, whilst they are during walkthroughs
d. A walkthrough is led by the author, whilst an inspection is led by a facilitator or moderator

Question 5: Clues

Which of the following is true regarding the process of fixing emergency changes?

Walkthrough reviews

- Objectives: Gain understanding / Find defects
- Led by author
- Open-ended sessions

Inspection reviews

- Objectives: Find defects
- Led by trained facilitator or moderator
- Formal process with follow-up meeting

Question 6

What statement about static analysis is true?

a. With static analysis, defects can be found that are difficult to find with dynamic testing
b. Compiling is not a form of static analysis
c. When properly performed, static analysis makes functional testing redundant
d. Static analysis finds all faults

Question 6: Clues

What statement about **static analysis** is **true**?

Static analysis

- Testing code without executing it
  - E.g. Compiling code
- Checks code / requirement and design documents
- Objective: Improve quality / Prevent defects / Verify software product
- Verification process → Have we built the *correct* software?

Dynamic testing

- Testing done by executing source code
- Validation process → Have we built the software *correctly*?

Question 7

Which of the following statements about early test design are true and which are false?

1. Defects found during early test design are more expensive to fix
2. Early test design can find defects
3. Early test design can cause changes to the requirements
4. Early test design takes more effort

a. 1 and 3 are true. 2 and 4 are false.
b. 2 is true. 1, 3 and 4 are false.
c. 2 and 3 are true. 1 and 4 are false.
d. 2, 3 and 4 are true. 1 is false.

Question 7: Clues

Which of the following statements about early test design are true and which are false?

- Early test design
  - Preventive action → Avoid defects being introduced
  - Find defects
    - Less expensive to fix defects during earlier stages → *Less to fix*
    - Less effort involved → *Less to do*
  - Reveals faults in requirements
    - Can change the requirements specification

Question 8

Static code analysis typically identifies all but one of the following problems. Which is it?

a. Unreachable code
b. Undeclared variables
c. Faults in the requirements
d. Redundant code

Question 8: Clues

Static code analysis typically identifies all but one of the following problems. Which is it?

- Static code analysis
  - Examination of code without executing it
  - Finds defects rather than failures
- Typical defects discovered
  - Undefined / unused variables
  - Inconsistent interface between modules and components
  - Unreachable code / Deadlocks / Duplicates
  - Programming standard violations / Syntax violations

Question 9

The _____ of a review process is related to the following factors:

- The maturity of the development process
- Any legal requirements for the software product/project
- The need for an audit trail

Question 9: Clues

The _____ of a review process is related to the following factors:

- Review process
  - Objectives: Find defects / Gain understanding / Decision-making
  - Different types of reviews
    - Informal review / Walkthrough / Technical review / Inspection
  - Varying degree of formality
    - What is the main objective of a specific review (meeting)?
  - How far we have come (maturity)
  - Jurisprudence and other regulations
  - Documentation and audit trails needed?

Question 10

Pair the following review activities with their description:

1. Planning	A. The facilitator distributes to all the participants the doc to be reviewed.
2. Initiate review	B. Each participant reads their part of the document and notes the defects found
3. Individual preparation	C. The author of the reviewed doc fixes the defects found and reported in the review meeting
4. Review meeting	D. A facilitator selects who is going to attend the review activity and assigns roles in the review process
5. Rework	E. The facilitator checks if the defects have been fixed
6. Follow-up	F. Meeting in which each participant lists the defects they have found. The author takes notes. The facilitator moderates the discussion.

Part II: Exercises and Open-ended questions

Exercise: Video

Watch video on "Clean Code"

By Robert Cecil Martin (Uncle Bob), one of the founders of the Agile manifesto.

https://www.youtube.com/watch?v=F9owUy1g_YE (5:43)

If you like it, watch the full video:
https://www.youtube.com/watch?v=7EmboKQH8lM (1:48:41)

Open-Ended Questions

Why do you think it is important to have clean code?

Why is it important to keep it clean?

Do you think it is good to impose coding conventions to a team?

For example: Naming conventions, tabs, complexity of methods, interfaces, API, etc.

Importance of Clean Code

Clean Code: Aspects to consider

- Rigidity / Dependencies
- Coupling
- Maintainability / Portability
- Robustness

Is clean code more important than efficient code?

- Back in the day → Important to write efficient code
- Maximise functionality packed into each kilobyte of storage
  - How tightly it compiled / How much RAM it used
- Perhaps no longer such marginal restrictions?

Coding Conventions

Guidelines for specific programming language

- Improve software quality
- Readability / Maintainability of source code
- Limit complexity

Recommendations for …

- Programming style
  - Such as comment conventions / Indentation / Line length / Naming conventions
- Practices and methods

Not enforced by compilers!

The End

Assignments

2-4 people in each group

Alt. I: Register as an individual. We form the groups

Alt. II: Register the entire group at once.