Software Design (F28SD2)

Dynamic & Static Analysis Summary

Andrew Ireland

Department of Computer Science
School of Mathematical and Computer Sciences
Heriot-Watt University
Edinburgh
Executive Summary

- Dynamic (testing) and static analysis are complementary.
- Testing can never show the absence of defects, but can increase confidence in the quality of a product.
- Static analysis does not require coding to be complete, it can be applied early within the development life-cycle.
- No “silver bullet” – use a range of techniques that provide different perspectives.
Dynamic Analysis

- Equivalence partitioning & boundary value analysis. *
- State based testing.
- Code coverage analysis, *e.g.* MC/DC testing etc. *
- Data definition-use testing.
- Assertion based testing & design by contract.
- Java’s assertion mechanism. *
- JUnit. *

Note: * denotes a topic with an associated skill that has been taught.
Static Analysis

- Reviews & Inspections.
- McCabe’s Cyclomatic Complexity measure. *
- Data & control flow analysis.
- Program slicing. *
- Information flow analysis.
- Formal methods: Design through to coding and assertion based proof.

Note: * denotes a topic with an associated skill that has been taught.
Typical Exam Questions

• Explain the technique known as program slicing and the roles that it can play within software development. (4 marks)

• Using a fragment of code containing at least 1 if-statement, illustrate the notions of a forward slice and a backward slice. (8 marks)

• Explain in detail the major components of a Fagan style inspection. (6 marks)

• Describe an advantage and a disadvantage of the process of inspection within the software development life-cycle. (2 marks)
Typical Exam Questions

• Explain the following software coverage metrics:
  – Decision Coverage (DC)
  – Condition/Decision Coverage (CDC)
  – Modified Condition/Decision Coverage (MC/DC)
Your explanation should include an advantage and a disadvantage of each metric (9 marks)

• Use CDC and MC/DC coverage to generate test cases for the following schematic conditional statement:
  \( \text{if}((C1 \&\& C2 \&\& C3) | | C4) \text{ S1; else S2; } \) Use a truth table style of presentation and clearly show the values for \( C1, C2, C3, C4 \) with respect to the execution of statements \( S1 \) and \( S2 \). (8 marks)

• What is regression testing and why is it important? (3 marks)