Exam Rehearsal

Lecture 12

Software Engineering
TDDC88/TDDC93
autumn 2013

Kristian Sandahl
Department of Computer and Information Science
Linköping University, Sweden
kristian.sandahl@ida.liu.se
Agenda - What will you learn today?

Part I
Study Information

Part II
Exam Information

Part III
Example Exam Questions
Part I
Study Information
References and information that are fundamental for the exam (1/2)

**SE General**
- Pfleeger and Atlee: Chapter 1.

**Area 1: Requirements**
- Pfleeger and Atlee: Chapter 4.
- IEEE-Std-830-1998 (high-level) (Navigate from within the LiU-domain: LiU-home page, Library, Databases. Search for IEEE Xplore, enter and Browse standards, search for "830").

**Area 2: Planning and Processes**
- Pfleeger and Atlee: Chapter 2.
- Pfleeger and Atlee: Chapter 3.
- Manifesto for Agile Software Development
- Scrum introduction YouTube video
- Official Scrum guide
- Kanban vs Scrum
- OpenUP resource web (high-level)
- Extreme programming website (high-level)

**Area 3: Design and Architecture**
- Pfleeger and Atlee: Chapter 5.
- Pfleeger and Atlee: Chapter 6.
- Design pattern (high-level)
- SOA and Amazon (high-level)
Literature (Recommended Reading)

References and information that are fundamental for the exam (2/2)

Area 4: Testing and SCM
- Pfleeger and Atlee: Chapter 8.
- Pfleeger and Atlee: Chapter 9.
- Selenium webpage (high-level)
- Git- SVN Crash Course
- Free online book on subversion (high-level)
- The Git Community Book (high-level)
- Continuous Integration according to Martin Fowler

Area 5: Software Quality
- Pfleeger and Atlee: Chapter 4.9, 8.3, 13.2
- IEEE Standard for Software Reviews and Audits 1028-2008 (high-level), esp Section 6 Inspections.
- Pfleeger and Atlee: 6.7, 8.1, 8.8, 9.3, 9.9, 11.4
- Pfleeger and Atlee: 12 (Only very general questions about reuse can appear in a written exam)
- 13 (13.1 is outside the scope of this course. If it looks interesting, go for TDDD30)
- Short intro to TQM
- CMMI-DEV 1.3 Ch 1-3: Only the staged representation.
  Read purpose and introductory notes for the areas CM, OPD, PMC, PP, PPQA, RD, REQM, RSKM, TS, VAL, and VER.
These references are not needed for passing the exam.

**Area 1: Requirements**

**Area 2: Planning and Processes**

**Area 3: Design and Architecture**
- Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides. *Design Patterns: Elements of Reusable Object-Oriented Software*, Addison-Wesley Professional, 1994, ISBN: 0201633612
Complementary Literature
(Further Reading)

These references are not needed for passing the exam.

Area 4: Testing and SCM


Area 5: Software Quality


During your study many questions might arise. Collect your questions and come to this occasion.

- Location: Alan Turing
- Time: Friday, October 25, 12.30-14.00
  Wednesday, October 30, 12.00-14.00
Part II
Exam Information
**Examination - when?**

<table>
<thead>
<tr>
<th>Course part</th>
<th>Examination</th>
<th>Credits</th>
<th>Applicable to</th>
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<tbody>
<tr>
<td>Theory</td>
<td>Written Exam</td>
<td>2,5p, 4hp, 4 ECTS</td>
<td>TDDC88 and TDDC93</td>
</tr>
<tr>
<td>Project</td>
<td>Project Tasks</td>
<td>4p, 6hp, 6 ECTS</td>
<td>TDDC88</td>
</tr>
<tr>
<td>Laboratory exercises</td>
<td>Oral Exam and Written Exercises</td>
<td>1,5p, 2hp, 2 ECTS</td>
<td>TDDC88</td>
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</tbody>
</table>

**Written Exam (both TDDC88 and TDDC93)**

- Primary Exam 14:00-18:00, November 1, 2013
- Retake Exam 08:00-12:00, January 10, 2014
- Retake Exam August 2014
To pass the exam (alternatives)

1. a) at least 4 credits in all areas in fundamentals and b) at least 50 credits in total
2. a) at least 4 credits in at least 4 areas and b) at least 60 credits in total

Part I: Fundamentals
- Requirements
- Planning and Processes
- Design and Architecture
- Testing and SCM
- Software Quality
10 credits per area. Max 50 credits.

Part II: Advanced
50 credits, distributed over 2-5 questions.
- argue, compare, and analyze different concepts and techniques.
- construct and/or design solutions to larger problem.
- explain more advanced and specific topics.

Part III
Exam Information
Example Exam Questions
<table>
<thead>
<tr>
<th>Total credits</th>
<th>Mark</th>
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<tbody>
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<td>0-49</td>
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<td>50-66</td>
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<td>67-83</td>
<td>4</td>
</tr>
<tr>
<td>84-</td>
<td>5</td>
</tr>
</tbody>
</table>
Allowed aids

- Two sheets of **handwritten** A4 papers (can write on both sides)
- One volume of dictionary to or from English or an English wordbook.

Explicitly forbidden aids

- Textbook
- Machine-written pages
- Photocopied pages
- Pages of other format than A4
- Electronic equipment
Part III
Example Exam Questions
Part 1 - Fundamentals

Requirements

1 a) Which of the following statements are true? Answer with the statement letter only, no motivation is needed. (2)

A. We say that two requirements are testable if, and only if, they can always be satisfied simultaneously.

B. Prototyping can be used both for requirements elicitation and requirements validation.

C. An Entity-Relationship diagram is useful when we want to describe the dynamic behaviour of an embedded control system.

D. The IEEE Standard 830 for Software Requirements Specification encourages you to adapt the disposition of headlines to your particular application.
Requirements

1b) A centralized patient information management system keeps all information of patients treated by the hospitals in a health care region. Health care personnel and the patients themselves can read or sometimes edit the information. There are strict rules for confidentiality, integrity and availability. Draw a use-case diagram of this system with two different use-cases and two different actors. Don’t forget the use case texts. Use full sentences. Logging in to the system is not a use-case of its own.
Requirements

1 c) Write down two functional and two non-functional requirements of the patient information system described in problem 1b).
Planning and Processes

2 a) Which of the following statements are true? Answer with the statement letter only, no motivation is needed. (2)

A. The process in SCRUM is the main focus, so the sprint retrospective continues as long as is necessary even if it delays the sprint planning.
B. A task board in SCRUM is an organization that sets priorities on changed and new product backlog items.
C. SCRUM can be used for many different types of projects, not only software development.
D. Many practices from eXtreme Programming (XP), such as pair programming, test-first programming, and refactoring can be chosen to be used by a SCRUM team without violating ideas behind SCRUM.
Planning and Processes

2 b) Describe the four dependent project parameters as taught in the course.
Part 1 - Fundamentals

Planning and Processes

2 c) Describe three advantages and one drawback of *iterative software development*.
Design and Architecture

3 a) Which of the following statements are true? Answer with the statement letter only, no motivation is needed. (2)

A. In a UML state diagram the transitions are denoted action/event, where action is the functions to execute during transition, and event is the underlying cause for the transition.
B. In a three-tiered client-server architecture you have the possibility to balance the load between servers.
C. The Façade design pattern allows algorithms to be selected at runtime.
D. The implementation view of an architecture gives you information of, for example, how the source code files of a system are organized.
Design and Architecture

3 b) Describe three advantages of a *layered architecture style*. Describe the concept of *layer bridging*.
Design and Architecture

3 c) Draw a class diagram of the classes Vehicle, Car, Motorcycle, and Wheel that allows the instantiations in I:, but not the ones in II:, and not those in III:

I:

III:

II:
Part 1 - Fundamentals

Testing

4 a) Which of the following statements are true? Answer with the statement letter only, no motivation is needed. (2)

A. Stress test means that you test what is happening if a user only gets a limited amount of time to try to enter the correct input.
B. In the software engineering terminology an error is a human mistake leading to a fault in the program, which if executed can cause a failure.
C. If you want to achieve branch coverage testing of a program you need at least as many test cases as you would need if you were satisfied with statement coverage testing.
D. Regression test means that you use linear regression on data from test-logs to find out when to stop testing.
Testing

4 b) Write down an advantage of each of the integration testing strategies: Big-bang, Top-down, Bottom-up, and Sandwich integration testing. (4)
Testing

4 c) Describe the work-flow of continuous integration from the perspective of a developer.
Quality Factors (Software Quality)

5a) Which of the following statements are true? Answer with the statement letter only, no motivation is needed. (2)

A. In object-oriented software, a class’s *depth in the inheritance tree* means that the software is harder to understand. A large depth gives lower *understandability*. The reason is that in a deep hierarchy, you are more likely to find *inherited methods* and *attributes*.

B. A high *number of reused code lines* can be an indicator of high *reliability* with the argument that the reused parts have been tested and run for a longer time than newly produced code.

C. If we draw a *flow-graph* of a program, that only contains *binary decisions*, then the *cyclomatic complexity*, $V(G)$, of the program grows quadratically with the number of decisions.

D. If MTBF=Mean Time Between Failures, the *Reliability* can be approximated by $MTBF/(1-MTBF)$
Quality Factors (Software Quality)

5 b) Describe an activity of the inspection leader (moderator) in each of the inspection phases: Plan and overview; Individual checking; Inspection meeting; and Edit and follow-up.
Quality Factors (Software Quality)

5 c) It is often said that people working in an organization at CMMI level 3 needs to be more creative than on lower levels. Describe two process areas at CMMI level 3 that gives an example of when creativity is needed. Don’t forget to motivate the answer.
Part 2 - Advanced

Similar to your lecture exercises

- argue, compare, and analyze different concepts and techniques.
- construct and/or design solutions to larger problem.
- explain more advanced and specific topics.

Explain what you mean.
Answer “why”?

Explain in words your diagrams. Explain the meaning of the notation.
6. A home temperature control system has the following requirements:
1. The cooler and the heater can never be on simultaneously.
2. If the cooler is on and the temperature becomes 18 °C or lower, then the cooler is turned off.
3. If the heater is on and the temperature becomes 22 °C or higher, then the heater is turned off.
4. If the both the heater and the cooler have been off for 20 minutes or more and the temperature is 18 °C or lower, then the heater is turned on.
5. If both the heater and the cooler have been off for 20 minutes or more and the temperature becomes 22 °C, then the cooler is turned on.

a) Assume that you are the test leader at the company developing the control system. Identify the input parameters and equivalence classes. Motivate your choice. (5)

b) Create a test table of five test cases performing boundary value testing. Motivate why you selected the test cases you did. (10)

c) Describe the advantages and disadvantages of boundary value testing compared to randomly generating test cases. (5)
7. When you buy railway tickets on-line you go through the following steps:
1. You specify departure and destination stations.
2. You specify if you need return ticket and the preferred times for outgoing and returning trains.
3. You specify number of passengers and if individual passengers are eligible for discounts.
4. You will get up to five suggestions of travel routes plus prices for different types of tickets. If you have a return ticket you will get similar information for the return. If you are logged in with your frequent traveller id, the customer database is checked for your normal preferences, before presenting alternatives.
5. You can either click the suggestions you want to buy or ask for earlier or later alternatives.
6. You can now check for added services, including seat preferences.
7. You come to a summary of your order and are asked to confirm or go back. You are asked to write down the full name of all passengers.
8. When the order is confirmed you select type of ticket delivery and payment method. You can either make a bank withdrawal or pay with credit card. Depending on the choice you are directed to your on-line bank or the credit card payment.
9. When everything is OK, you will be shown a receipt and a link to an e-ticket PDF-file if that option was selected.
8. A friend of yours wants to introduce *risk management* at his company. Since he knows about your great talent, he asks you to write him a convince-your-boss letter explaining what risk management is: the different types of risks, the different steps in risk management, the benefits you will get from risk management, documents needed, meetings needed, practical hints etc. (20)
Thanks for listening!

GOOD LUCK!
## Boundary value testing

<table>
<thead>
<tr>
<th>Id</th>
<th>Cooler</th>
<th>Heater</th>
<th>Temp</th>
<th>Minutes both off</th>
<th>Expected Action</th>
</tr>
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<tbody>
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<td>Cooler off</td>
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<tr>
<td>3</td>
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<td>19</td>
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</tr>
<tr>
<td>4</td>
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<tr>
<td>5</td>
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<td>On</td>
<td>22</td>
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<tr>
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<td>NA, 20</td>
<td>19</td>
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</tr>
<tr>
<td>8</td>
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<td>17</td>
<td>20</td>
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<tr>
<td>9</td>
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