

# DAT230/DAT231/ DIT276 Requirements Engineering

## Exam + Solution

Monday, October 23<sup>rd</sup>, 2017

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### Examiner

Eric Knauss +46 31 772 10 80

### Contact person during exam

Eric Knauss +46 31 772 10 80

### Allowed tools / material

None except pen/pencil and eraser

### General information

Numbers within parentheses show the maximal points awarded for each question.

Maximal points can be given if:

- The answer is correct.
- The presentation of the answer is readable and clear.
- The answer is given in English. □

Each question must be answered on a new sheet of paper. Hence, the answers to Question 1 and 2 must NOT be written on the same sheet of paper. You are NOT allowed to write answers to questions on the backside of a sheet of paper!

### Grading

The grades on this exam are based on your total score on the questions. For Chalmers students:

0 – 39 points: Fail

40 – 51 points: 3

52 – 63 points: 4

63 – 80 points: 5

For GU students:

0 – 39 points: Fail

40 – 63 points: G (Pass)

63 – 80 points: VG (Pass with distinction)

### Review

~~2017-Nov-17, 10-12, Room: J121~~

**2017-Nov-20, 8:15-10:00, Room J121**

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**Institutionen för Data- och informationsteknik**

**CHALMERS TEKNISKA HÖGSKOLA & GÖTEBORGS UNIVERSITET**

# Part 1 – Multiple Choice (30p)












## Question 1: Multiple-choice problems (26p)

This part consists of multiple-choice problems. These problems consist of pairs of *propositions* and *reasons*. For each problem, you shall answer by using one of the following answers:

- A** Both the proposition and the reason are correct statements. In addition, the reason explains the proposition in a correct way, i.e. the reason explains why the proposition is correct.
- B** Both the proposition and the reason are correct statements, but the reason does not explain the proposition.
- C** The proposition is a true statement, but the reason is false.
- D** The proposition is false, but the reason is a true statement.
- E** Both the proposition and the reason are false.

Correctly answered problems give **1 point**, while incorrect or missing answers give 0 points, regardless if you are partially correct in your answer!

	<i>Proposition</i>	<i>Reason</i>	<i>Answer A B C D E</i>
1) <b>(1p)</b>	According to [AGRE], agile RE suggests frequent collaboration with an accessible and available onsite customer.	Customer involvement and interaction have been reported as primary reasons for project success or limited failure.	A <input type="checkbox"/>
2) <b>(1p)</b>	Cross-functional teams increase the risk of miscommunication and over-scoping of requirements.	Cross-functional teams include members from different functional groups (such as testers, designers, developers) who intermingle and share knowledge.	D <input type="checkbox"/>
3) <b>(1p)</b>	R1 ICOST R2 denotes that R2 affects the cost of implementing R1	In some cases, there can be more than one relationship type between requirements.	D <input type="checkbox"/>
4) <b>(1p)</b>	Requirements validation is about customers checking that requirements reflect their demands correctly.	Acceptance test is a requirements validation technique.	C <input type="checkbox"/>
5) <b>(1p)</b>	Requirements elicitation is a difficult process.	Sometimes the product is completely new and nobody has used IT for the problem before.	A <input type="checkbox"/>
6) <b>(1p)</b>	An analyst shall document how each business goal is reflected in the requirements.	It is the supplier's responsibility to reach the customer's business goals.	C <input type="checkbox"/>

7) <b>(1p)</b>	A data model is insensitive to the level of abstraction we work on.	If we make an E/R model of the information occurring in the domain, the model will be similar to an E/R model of the data, inside the final product.	A (C)	
8) <b>(1p)</b>	Context diagrams can reflect an early decision about the scope of the product.	Context diagram arrows can refer to either dataflow or events.	B	
9) <b>(1p)</b>	It's generally unnecessary to identify all events in the inner and outer domains.	Customers can generally validate a list of product events better than they can validate a list of domain events.	E	
10) <b>(1p)</b>	Customers may dream up so many features that the whole system becomes unrealistic.	Feature requirements are hard to understand for the customer.	C	
11) <b>(1p)</b>	When using screens and prototypes, it is enough to review the screens to validate task support and high usability.	Experience has shown that screens as requirements leads to a smoother programming phase and a higher user acceptance of the product.	D	
12) <b>(1p)</b>	Actors that are not in the immediate surrounding of the product (the "inner domain") should be excluded from the task descriptions.	Business process re-engineering takes the present user tasks for granted.	E	
13) <b>(1p)</b>	A development process requirement can be used when requirements are vague and time is short.	The sole purpose of development process requirements is to serve as a framework for structured requirements management.	C	
14) <b>(1p)</b>	In practice, we have to live with tacit requirements.	In principle, we can assume that domain knowledge is non-obvious and specify all requirements in detail.	B	
15) <b>(1p)</b>	Using quality grids, requirements engineers shall specify the concerns behind the priority of all the specified quality factors.	Quality grids are used to present the importance of quality factors.	D	
16) <b>(1p)</b>	A technique that reports that a threat to security was successfully exploited in the software under development is a prevention kind of safeguard.	Prevention techniques reduce the occurrence of security threats.	D	
17) <b>(1p)</b>	The requirement "The product shall prevent users from deleting invoices before transferring them to the account system." is an example of a requirement that deals with fraud threats to security.	The presence of temporary account data on the product exposes risks.	A	

18) <b>(1p)</b>	In practice, it is often difficult to distinguish functional and non-functional requirements.	Quality requirements often manifest as extra functionality.	A	<input type="checkbox"/>
19) <b>(1p)</b>	It is important to consider trade-offs between quality requirements.	If more than one quality is important, these qualities will be in conflict with each other and must be balanced.	C	<input type="checkbox"/>
20) <b>(1p)</b>	The observation technique for elicitation of requirements is needed only when there is no user to ask about how user tasks are done.	The users can explain what they do, so if they are available, an analyst could ask them about their tasks.	E	<input type="checkbox"/>
21) <b>(1p)</b>	A requirements analyst can use questionnaires to gather opinions and suggestions.	When collecting data through questionnaires, the requirements analyst can use open questions as he would ask during an interview.	A	<input type="checkbox"/>
22) <b>(1p)</b>	During the brainstorming session, unrealistic ideas shall be criticized and possibly rejected.	If the generated ideas are not criticized, there will be many unrealistic ideas left to discuss.	D	<input type="checkbox"/>
23) <b>(1p)</b>	Managers are not needed to participate in domain workshops.	They rarely know the real details of the procedures and can not replace the expert users.	D	<input type="checkbox"/>
24) <b>(1p)</b>	It is crucial that in the design workshops, the team checks the task descriptions and business goals often.	When users in the design workshop become very committed to the solution they design, they can divert from the goal, which threatens the result of the workshop.	A	<input type="checkbox"/>
25) <b>(1p)</b>	Goal-domain tracing is a checking technique which is an important part of requirements elicitation.	Goal-domain tracing can detect missing requirements, and goals.	A	<input type="checkbox"/>
26) <b>(1p)</b>	The requirement R1 "The system shall process all keyboard strokes quickly, in order for a user to not be disturbed by latency" is not valid	R1 is not quantifiable (measurable)	D	<input type="checkbox"/>

## Question 2. Match-assignment: Problem sources (4p)

This part of the exam consists of a *match-assignment* where different alternatives shall be matched with the most suitable, proposed, alternative. A correct answer gives **0.5 points**, while incorrect or missing answers gives 0 points even if you are partially correct in your answer!

### Requirements state

- A** Programm Error
- B** Requirement Defect
- C** Usability Problem

Match an alternative from the list above (A-C) with the most suitable alternative in the table below (1-8). The same letter may be the answer in more than one row of the table; some letters may not be the answer in any row. Only one letter (A-C) shall be placed on each row!

	<i>Description</i>	<i>Answer A B C</i>
1) (0.5p)	It is impossible to carry out the user registration task.	B <input type="text"/>
2) (0.5p)	The user erroneously believes that the registration task is completed.	C <input type="text"/>
3) (0.5p)	The user can register after lengthy attempts.	C <input type="text"/>
4) (0.5p)	The user registration functionality does not work as the programmer had intended.	A <input type="text"/>
5) (0.5p)	The system does not provide the necessary fields to store user data.	B <input type="text"/>
6) (0.5p)	The system crashes when the user attempts to store user data.	A <input type="text"/>
7) (0.5p)	The user is asked to include between 2 to 4 digits in the new password. The program only checks whether the password includes any digits.	A <input type="text"/>
8) (0.5p)	The user thinks he has updated the password successfully, but the system requires the user to confirm the new password to complete the updating task.	C <input type="text"/>

## Part 2: Apply RE Knowledge (10p)

### Question 3: Usability requirements and risk (10p)

Ms. Taylor has been in contact with Requirements Engineered Ltd., a company specialized in Requirements Engineering and bespoke development, to realize one of her project ideas. The company has worked for several months to come up with a specification. Now, Ms. Taylor would like to move to the next step and sign a contract for development of the resulting specification. She has asked you, as an expert in Requirements Engineering, to give her a second opinion on the following requirements.

R1	At most 1 of 5 novices shall encounter critical problems during tasks Q and R. At most 5 medium problems shall be encountered in total.
R2	Novice users shall perform tasks Q and R in 15 minutes. Experienced users shall perform tasks Q, R, and S in 2 minutes.
R3	Recording breakfast shall be possible with 5 keystrokes per guest. No mouse.
R4	80% of users shall find system easy to learn. 60% shall recommend system to others.
R5	Show 5 users 10 common error messages, e.g. Amount too large. Ask for the cause. 80% of the answers shall be correct.

Which issues and risks do you see in these requirements? Name each issue/risk, argue whether it applies to supplier or customer, and motivate why you think it is problematic/risky.

All requirements but R3 are non-atomic.

R1: Novice, medium and critical problems are not defined and can therefore lead to misunderstandings or disagreements between customer and developers. Tasks Q and R are also not defined. Furthermore, it is unclear what the actor is in the second sentence. Is it only novices that shall encounter medium problems, or all users?

R2: As in R1, novice and experienced are undefined. It is unclear whether the defined times are per task or in total.

R3: The actor is not defined. No mouse is unclear. Also, recording breakfast is not defined (could be somewhere else in the SRS).

R4: Easy to learn is ambiguous. It is unclear how this is measured. Similarly, it is unclear how recommendation is measured. Furthermore, it is unclear whether the 60% are related to the 80% how find it easy to learn, or to all users. Finally, recommendation is likely to depend to a large extent on the users' behaviour, not the system. Hence, it's particularly risky.

R5: Common error messages are unclear. Also, the example does not help. Ask for the cause seems to be an instruction for measurement rather than a requirement. What a correct answer constitutes is unclear.

## Part 3 – Essays (40p)

For each topic below, write an essay that includes all of the listed concepts within the given maximum number of pages. The essays are graded based on

- (a) how well the topic is described using the concepts in the list under each topic (thus judging the general flow and argumentation), and
- (b) how well the concepts in the list are described and/or exemplified in the essay (thus, points are given for each concept that is mentioned and explained in sufficient depth).

Please make an effort to write readable. Essays that are difficult to read or difficult to understand will render a deduction of received points. An unreadable essay will receive zero points! Each essay should start on a new sheet of paper.

### Question 4: Topic: Difficulties of Elicitation (10p)

Max 1 page!

*List of concepts:* Gulfs of understanding, symmetry of ignorance, tacit knowledge, stakeholder, interviews

#### Sketch of solution:

**Gulfs of understanding:** Important that it is about no common ground, no shared language between stakeholders. Why is it the case? ...a problem?

**Symmetry of ignorance:** Domain expert does not know what technical solutions exist/are possible; supplier does not know what problem the technical solutions could address, consequently they do not talk about important stuff (since they don't know what to ask)

**Tacit knowledge:** Stakeholder does not mention seemingly obvious things that may later be missing (either because they think it is obvious or because it does not come to their mind). In addition, one could also consider that if it is both obvious for customer and supplier, then no need to document it - but then it is also no problem.

**Stakeholder:** Some characterisation (has interest in project) plus a few examples

**Interviews:** One of the following: {types of interviews, when to use them + drawbacks/adv, difficulties with interviews}; some expectation that it is exemplified or marginally related to the other concepts

### Question 5: Topic: Managing Quality Requirements (10p)

Max 1 page!

*List of concepts:* Quality Grid, Planguage, Open Metric, Relationship to Functional Requirements

**Sketch of solution:** For each concept: 1p if explained and exemplified, 1p if related to managing quality requirements, 0-2 points on how well the topic is described.

### Question 6: Topic: Agile Requirements Engineering (10p)

Max 1 page!

*List of concepts:* Agile RE practice, Challenge in Traditional RE Solved by Agile RE, Challenge of Agile RE, Breadth-First RE, Just-in-time RE

**Sketch of solution:** For each concept: 1p if explained and exemplified, 1p if related to agile requirements engineering.

- Agile RE practice: Mention one, e.g. while discussing the challenges.
- Challenge in Traditional RE: Mention one, explain why this is a challenge and how it is solved in agile (not just which practice, but elaborate a bit (few words/1 sentence) how for example XFTs help with communication)
- Challenge in Agile RE: Mention a challenge, make clear what the challenge is and elaborate a bit on why it will show in agile, e.g. if customer sees frequent iterations, they will give a lot of feedback, this will result in frequent changes of requirements
- Breadth-first: At least 2 or 3 of the following: What is it, what is the rationale behind? example? Who is responsible?
- JIT: At least 2 or 3 of the following: What is it, what is the rationale behind? example? Who is responsible?

**Question 7: Topic: Data Requirements (10p)**

Max 1 page!

*List of concepts:* Data model, Data dictionary, Virtual Windows, Specify Quality of Data, Relationship to Functional Requirements

**Sketch of solution:** For each concept: 1p if explained and exemplified, 1p if related to data requirements.

Details:

- Data model: More than just ER, that is just one example. Overview, needs experts
- Data dictionary: Textual, yes, but also formal. Offers details, easier to understand, lack of overview, can cost a lot.
- Virtual windows: Must relate to data. Probably should discuss the advantage for validation, the risk to focus on wrong things, the suggestion to show real/special cases, the disadvantage of effort, ...
- Specify quality: Sometimes, we need to specify the quality attributes of data so that the functions can operate. Could mention: No clear mechanism available, not a requirements problem, how to define timeliness and privacy. Fewer points when defining quality of data requirements.
- Relationship to functional requirements: Functions process data, thus functional requirements and data requirements should be traced and kept consistent.