

DAT321/DIT847:

Software Quality

Welcome to the examination for the *Software Quality*! The examination is intended to last for max **4 hours** and is intended to be **anonymous** (i.e., the teacher grading your exam will not know your name). Therefore, it is important that you follow the instructions (in the separate exam cover sheet) and **do NOT leave any information that would reveal your name on these pages.**

Each question has a number of points assigned shown in the square brackets. When the question is broken down into smaller sub-questions the part of the points for that specific sub-questions are also shown as following:

1. [10 pts].
 - a. [2 pts]
 - b. [8 pts]

The percentage of points and the corresponding grade is presented below (100 points in total):

% of points	DAT321	DIT847
[0, 50%)	2	U
[50%, 65%)	3	G
[65%, 85%)	4	G
[85%, 100%]	5	VG

It is important that you write **clearly** so that the examiner can read your answer. If your handwriting is unreadable, then you will not get any points for that question. We will NOT assess grammar or spelling as long as your answer is readable, understandable and unambiguous.

The questions in this exam refer to the **ISO 25010:2011** that categorises internal and external software quality attributes into eight characteristics.

You are allowed to have the English ↔ Swedish dictionary during the examination. CTH/GU approved calculators are also allowed, but NOT calculators in mobile phones.

Questions about the exam:

Contact: Francisco Gomes, tel. 031 772 6951, gomesf@chalmers.se

First visit: around 15:15

Second visit: around 17:10

The exam review is scheduled for 2018-11-15, between 13:30 – 14:30 at Jupiter building, 4th floor, Room 424.

Examination date: 2018-11-01

The questions in this exam are related to the following context. Note that the answers should, in turn, be justified based on i) the theory and terminology from software quality and ii) their connections to the elements in this context (team, tools, processes, stakeholders, etc.).

Description of the context:

You've become part of a team responsible for developing software components that will be part of a car. The components developed by your team will interact with mechanical parts of the car and will have significant roles in controlling essential parts of the vehicle. The project you are assigned to needs to develop a component that will use information from various sensors in the car to assist driving of the vehicle (by notifying drivers of objects around), as well as monitoring speed of the car and fuel consumption. Failures in the sensor, or even delays in transmitting data can lead to severe consequences to safety.

Your team is composed of software and mechanical engineers that never worked together before. Additionally, some of those engineers have only worked with traditional software development where most of the planning is done upfront, and verification and validation (V&V) activities are done closer to releases. On the other hand, the company invested in state of the practice tools for traceability and configuration management, such that all artefacts and documents produced by your team is under version control.

Another important factor of your project is that one of the components that your team is developing is highly dependent to an existing legacy component, where very little testing exists. For now, your development process has to use the legacy component, but the company's expectation is that the legacy component will be replaced by a newer one. Keep in mind that your component will be part of a larger system with distributed components and access to online applications hosted on the cloud.

1. **[20 pts]** Using the context above, answer the following questions:
 - a. [10 pts] Describe two software product quality's characteristics, **and** provide an example on why they important for the component in our context (i.e., the component that communicates with the sensors in the car).
 - b. [5 pts] Explain the differences between analyzing product quality and quality in use.
 - c. [5 pts] Provide one example of quality in use characteristics using the provided context. Feel free to use other software components of the car in your example.

<please write your answer here>

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2. **[15 pts]** Using your knowledge on software quality measures, answer the following:
 - a. [5 pts] McCabe and Henry and Kafura are two distinct complexity measures used to in software quality. Are they used for internal or external quality? Justify your answer.
 - b. [10 pts] What are the differences between both measures in terms of software complexity?

<please write your answer here>

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- 6. [15 pts] Even though the legacy component of your project lacks tests, one engineer has logged, for each class in the source code, the McCabe complexity value and the corresponding lines of code. In order to make more informed decisions on maintenance of your legacy component, Alice suggests we use Bayesian Data Analysis and the data from three years maintenance to fit a linear regression predicting a class's McCabe complexity using its lines of code as a predictor.

Write down the *mathematical model definition* for this regression using *any* variable names and priors of your choice. Defend your choice of priors and remember to state your assumptions regarding your model!

<please write your answer here>

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