

Data & Information – Test 1 (1.5 hours)

4 May 2018, 13:45–15:15

Program: Technical Computer Science / Business & IT

Module: Data & Information (201300180)

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Please note:

- Please answer every question on a different sheet of paper (the answers will be distributed to different persons for grading).
- You are not allowed to bring any study materials to the test; essential excerpts from the study materials are available as appendices. You do not need a calculator.

Grade = #points/10

Case description for Questions 1 and 2

NeighborhoodCar facilitates car rental among private citizens. If you need a car for a short period of time, it is more convenient and cheaper to get it from a private person in your neighbourhood than from a commercial car rental company.

The NeighborhoodCar website or NeighborhoodCar app can be used for registering as a user, making a car available for rent, or reserving a car.

For the car rental itself, the app is indispensable for assuring that the right procedures are followed – at the pick-up of the car and at its return, owner and renter must enter some data into the app.

A (prospective) car renter can browse the available cars and filter them on location, available time, car type, or price per hour. When you make a reservation, the owner can confirm or decline. (A reason for decline could be that the owner needs that car after all at the requested time). After the owner confirms the reservation, the renter makes a final (and binding) confirmation.

At pick-up, the owner has to fill in the last four digits of the renter's driving license, so as to make sure that s/he has seen it. The renter has to confirm that the car has no other damage than what is shown in the app. Both have to fill in the odometer count.

Similarly, when the car is returned, both owner and renter have to fill in some simple data. (It gets more complicated if some damage occurred...)

Question 1 (Requirements) (30 points)

- From the 8 categories of quality characteristics (*boldface in Appendix A*), select three that you consider important for the NeighborhoodCar system (server and app)
- For each of the three selected categories, give the quality characteristic (*regular font in Appendix A*) in this category that you consider most important for the system. Explain your choices.
- For each of these three important quality characteristics, give an example of a meaningful quality requirement. (*It does not have to be factually correct but should show what a requirement for this quality characteristic could look like.*)

See appendix A for a complete list of quality characteristics according to ISO/IEC standard 25010.

Question 2 (Database queries) (40 points)

The requested queries use the following tables. Each car has an owner (pid). Multiple periods of availability could apply to a car. A rental links a car (cid) to a renter (pid). Damage is related to a rental (rid) and thus indirectly related to a car and a renter.

| Person | |
|-----------------|-------------|
| pid | integer KEY |
| name | text |
| first_name | text |
| house_no | text |
| postal_code | text |
| driving_licence | text |

| Car | |
|----------------|-------------|
| cid | integer KEY |
| licence_plate | text |
| brand | text |
| model | text |
| year | integer |
| price_per_hour | real |
| pid | integer |

| Availability | |
|-----------------|-------------|
| aid | integer KEY |
| available_from | timestamp |
| available_until | timestamp |
| cid | integer |

| Rental | |
|-------------|-------------|
| rid | integer KEY |
| cid | integer |
| pid | integer |
| confirmed_1 | boolean |
| confirmed_2 | boolean |
| start | timestamp |
| end | timestamp |

| Damage | |
|-------------|-------------|
| did | integer KEY |
| description | text |
| rid | integer |

Write the following queries in SQL – please remove duplicates where needed.
Relevant parts of the SQL syntax are given in Appendix B.

- Give a list of names and postal codes of owners of cars that never got damaged during a NeighborhoodCar rental.
- Give a list of names and first names of persons who caused damage to at least two different cars during a NeighborhoodCar rental.
- Give a list of cars owned by persons in Enschede, sorted by how many times they were rented (highest number of rentals first). Only include cars that were rented at least 5 times. For each car, give licence plate; brand; model; name of the owner; number of rentals. A car is located in Enschede if the postal code is between 7500AA and 7549ZZ.

Question 3 (Web programming) (30 points)

- a) How is a Web Servlet (HttpServlet object) capable of inspecting the HTTP request message and setting values of the HTTP response message when processing an HTTP request message at the server-side?
- b) What is the main benefit of using JavaScript for developing the client-side of web applications if compared with using only HTML and Servlets?
- c) How is it possible for an HTML page with a JavaScript script to invoke a RESTful service and show the result of this invocation to the end user? Which capabilities of JavaScript are normally used for that?

Appendix A: Quality characteristics (ISO/IEC 25010:2011)

| | |
|--|---|
| Functional suitability <ul style="list-style-type: none"> – Functional completeness – Functional correctness – Functional appropriateness | Reliability <ul style="list-style-type: none"> – Maturity – Availability – Fault tolerance – Recoverability |
| Performance efficiency <ul style="list-style-type: none"> – Time behavior – Resource utilization – Capacity | Security <ul style="list-style-type: none"> – Confidentiality – Integrity – Non-repudiation – Accountability – Authenticity |
| Compatibility <ul style="list-style-type: none"> – Co-existence – Interoperability | Maintainability <ul style="list-style-type: none"> – Modularity – Reusability – Analysability – Modifyability – Testability |
| Usability <ul style="list-style-type: none"> – Appropriateness recognizability – Learnability – Operability – User error protection – User interface aesthetics – Accessability | Portability <ul style="list-style-type: none"> – Adaptability – Installability – Replaceability |

Appendix B: Excerpts from SQL syntax

(choice is indicated by “[]”, optional inclusion by “[...]”)

select clause:

```
SELECT [ DISTINCT ] '*' | (aggregate) columns
FROM tables
[ WHERE condition ]
[ GROUP BY columns
  [ HAVING condition ] ]
[ ORDER BY columns [ DESC ] ];
```

condition:

```
boolean expression | [ NOT ] EXISTS ( select clause )
```