201300180 Data & Information – Test 1 (1.5 hours)
4 May 2016, 13:45–15:15

Please note:
- Please answer every question on a different sheet of paper (the answers will be distributed to different person for grading).
- You can give your answers in Dutch or English.
- You are not allowed to bring any study materials to the test; essential excerpts from the study materials are available as appendices.

Grade = #points/10

Question 1 (Requirements) (30 points)

Answer the following questions for the vital body functions monitoring system described below.

Please note: "the system" concerns the network, central storage facility and peripheral equipment that is owned by the hospital. It does _not_ include the transceivers and measurement equipment, for which adequate quality levels have been guaranteed by contract by the supplier.

- State three quality factors (quality characteristics) which you consider most important for this system. Prioritize them from 1 to 3.
- For each of these quality factors, explain why you consider it to be among the top three.
- For each of these quality factors, 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 factor could look like.)

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

Remote monitoring of vital body functions in a hospital
For some patients in a hospital, essential body functions need to be monitored 24/7.
For example, persons who suffered a heart attack need to have their ECG (electrocardiogram, i.e. heart function) monitored permanently for a number of days. Also, with some groups of oncology patients, the oxygen level in the blood (SpO_2, _peripheral oxygen saturation_) is monitored permanently.
Both can be measured non-invasively by equipment attached to the patient.

These days there is portable equipment for this, so that the patients do not need to stay in bed the whole day. The portable devices, to which ECG or SpO_2 measurement equipment can be attached, are called _transceivers._

A nurse straps the transceiver to the patient, attaches the monotoring equipment to the patient and connects it to a transceiver. The patient is then free to walk around within the perimeter of the hospital. The transceiver transmits the measured data to a central montoring computer through the hospital's wifi network.

The following special situations can occur:
- *Measurements show an emergency situation*. The nursing staff is alerted by the central computer system and takes appropriate action. The patient's location is known by means of the transceiver's GPS. In order to competently handle emergencies, well-trained nursing staff must be available 24/7.
- *The received measurement values are meaningless*. Typically a loose contact, caused by some action of the patient. The computer system gives a (non-emergency) signal on the screen of the central monitor to indicate that a technical problem occurred. Also, the system alerts the transceiver, which starts beeping to inform the patient that something is wrong. Loose connections can sometimes be fixed by the patients themselves. If not, the'll return to the ward, as the device will continue to beep until the issue has been solved.
- *The transceiver lost contact with the central computer system*, e.g. the patient has moved out of reach of the wifi network. Both sides notice that the connection has been lost and notify nursing staff and patient as above. The transceiver stops beeping when the connection has been restored.

Question 2 (Web programming) (30 points)

a) How is it possible for a Servlet to inspect the contents of an HTTP request message when such a message is forwarded to the Servlet? Explain which programming constructs (classes, methods, etc.) are used for that.

b) Identify and explain at least one similarity and one difference between a Cookie and an HttpSession.

c) Which constructs play the role of Model, View and Control in the MVC architecture for web applications introduced in this module? Explain your answer properly.

Question 3 (Database queries) (40 points)

The requested queries use the following tables with data about movies, persons, actors, directors, scriptwriters, genres, languages, cerifications, and runtimes.

Movie	
mid	Integer KEY
name	text
year	numeric(4,0)
plot_outline	text
rating	numeric(2,1)

Person	
pid	integer KEY
name	text

Acts	
mid	integer
pid	integer
role	text

Directs	
mid	integer
pid	integer

Writes	
mid	integer
pid	integer

Genre	
mid	integer
genre	text

Language	
mid	integer
language	text

Certification	
mid	integer
country	text
certificate	text

Runtime	
mid	integer
country	text
runtime	numeric(3,0)

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

a) Give an alphabetically ordered list of the names of all actors who acted together with George Clooney in one or more movies.

b) For any movie that has been released in French, give the name of the movie and average runtime for all the countries in which the movie has been released. Only include movies with a minimal runtime of at least 100 (minutes).

c) Give a list of movies that have been released in the Netherlands with certification 'AL' (allowed for all ages) but do not have not any certification (i.e., were not released) in Belgium.

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

Functional suitability	Reliability
— Functional completeness — Functional correctness — Functional appropriateness	— Maturity — Availability — Fault tolerance — Recoverability
Performance efficiency	**Security**
— Time behavior — Resource utilization — Capacity	— Confidentiality — Integrity — Non-repudiation — Accountability — Authenticity
Compatibility	**Maintainability**
— Co-existence — Interoperability	— Modularity — Reusability — Analysability — Modifyability — Testability
Usability	**Portability**
— Appropriateness recognizability — Learnability — Operability — User error protection — User interface aestethics — Accessability	— 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
```