Data & Information – Test 1 (1.5 hours)
12 May 2017, 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 person 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

Question 1 (Requirements) (30 points)

The University of Twente intends to replace Blackboard with a new digital learning environment. The new system should have all the basic fuctionalities that are currently used in Blackboard ("Must") but may also offer additional new features ("Could").
You may assume that the new system will <u>not</u> be used for storing students' grades. (Desired improvements in the dissemination of test results should be dealt with in Osiris, rather than in the successor of Blackboard.)

- State three quality factors (quality characteristics) which you consider most important for the new digital learning environment.
  Please choose from the 31 subcategories in the table in Appendix A, not from the 8 main categories.

- 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.

Question 2 (Web programming) (30 points)

a) (10 points) Give and explain two similarities and two differences between HTTP Servlets (extensions of the `HttpServlet` class) and Java Server Pages.

b) (20 points) Consider the following Java Bean:

```
package nl.utwente.di.test1;

public class Employee {
      private String firstName;
      private String familyName;
      private int age;
      private double salary;

      public String getFirstName() {
         return firstName;
      }

      public void setFirstName(String firstName) {
         this.firstName = firstName;
      }

      public String getFamilyName() {
         return familyName;
      }

      ... // all getters and setters are defined
}
```

Suppose now that a certain web application has been implemented using the simplified MVC pattern discussed in lecture 2. This web application uses the `Employee` Java Bean, a Servlet called `EmployeeServlet` that queries a database for the person information of an employee, and a JSP called `Employee.jsp` that displays this employee information to the end user. Explain how this application works, i.e., how the JSP, the Servlet and the Java Bean are called or created, by whom, which information they exchange and in which order.

Hint: to make your answer clearer we suggest that you give numbers the different 'steps' according to order in which they are performed.

Question 3 (Database queries) (40 points)

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

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

Acts	
mid	integer
pid	integer
role	text

Genre	
mid	integer
genre	text

Language	
mid	integer
language	text

Directs	
mid	integer
pid	integer

Certification	
mid	integer
country	text
certificate	text

Person	
pid	integer KEY
name	text

Writes	
mid	integer
pid	integer

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

Write the following queries in SQL.
- Please remove duplicates where needed
- If there are different ways to write the query, please give the shortest one.
Relevant parts of the SQL syntax are given in Appendix B.

a) Give a list of directors who co-directed a movie together with Steven Spielberg.

b) Give a list of movies directed by the Coen brothers (Joel and Ethan Coen) in which George Clooney does not act.

c) Movies may have a different runtime in the different countries where they are released.
Give a list of movies with a difference of a least 10 minutes in the runtime across countries.
For each of these movies, give the name, the shortest and the longest runtime. Sort the list by average runtime, from longest to shortest.

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

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