Data & Information – Test 1: Solutions

3 May 2019, 13:45–15:15

Question 1 (Requirements) (30 points)

The following quality characteristics follow clearly from the text:

1. *Operability* (The machines should easy to use, the Library wants to make it easier, not more difficult, to borrow a book)
2. *Accessability* (The self-service machines should be usable for persons with various disabilities)
3. *Confidentiality* (Data protection regulations should be followed)

Various other quality characteristics could apply as well and will be graded largely/partly correct. (*Safety* was explicitly mentioned in the text, but it is not listed in Appendix A, as it is a *quality in use* characteristic, rather than a *product quality* characteristic).

Examples of quality requirements:

1. (Operability) 80 % of the Library's visitors will be able to operate the machine for the first time without help of the Library staff
2. (Accessability) For a person in a wheelchair it should not be more difficult to operate te self-service machine than for an able-bodied person
3. (Confidentiality) Data handling should be GDPR-compliant

Question 2 (Database queries) (40 points)

a) Give a list of authors and the number of loans (past and present) of books of these authors. Sort the list from highest to lowest number of loans and include only authors with at least 100 loans.

```
SELECT a.name, COUNT(l.lid)
FROM Author a, Book_Title t, Book_Copy c, Loan l
WHERE a.aid = t.aid
  AND t.tid = c.tid
  AND c.cid = l.cid
GROUP BY a.name
HAVING COUNT(l.lid) >= 100
ORDER BY COUNT(l.lid) DESC
```

b) Two persons are *co-members* if they share a membership, i.e., they live at the same address and have their own individual membership pass.
Give the names and addresses of persons who have a co-member who never borrowed a book

```
SELECT DISTINCT p1.name, m.address
FROM Member m, Membership_Pass p1, Membership_pass p2
WHERE p1.pass_no <> p2.pass_no
  AND p1.mid = m.mid
  AND p2.mid = m.mid
  AND NOT EXISTS (
      SELECT l.lid
      FROM Loan l
      WHERE l.pass_no = p2.pass_no )
```

c) Give a list of author names and book titles for all books that were borrowed more than once by the same person.

```
SELECT DISTINCT a.name, t.title
FROM Author a, Book_Title t, Book_Copy c1, Book_Copy c2,
                             Loan l1, Loan l2
WHERE l1.pass_no = l2.pass_no
  AND l1.lid <> l2.lid
  AND l1.cid = c1.cid
  AND l2.cid = c2.cid
  AND c1.tid = t.tid
  AND c2.tid = t.tid
  AND t.aid = a.aid
```

or (*shorter, but trickier to get right*):

```
SELECT DISTINCT a.name, t.title
FROM Author a, Book_Title t, Book_Copy c, Loan l,
WHERE a.aid = t.aid
  AND t.tid = c.tid
  AND c.cid = l.cid
GROUP BY l.pass_no
HAVING count(l.lid) > 1
```

Question 3 (Web Programming) (30 points)

a) Application servers provide a runtime environment for Servlets to execute, so that HTTP Requests are forwarded to the proper Servlets and their corresponding HTTP Responses are sent back to the clients.

b) This can be done by defining deployment descriptors (web.xml file) or adding annotations to the Java code (i.e., a @WebServlet annotation), in which mappings between URLs and Servlets (and Servlet classes) are defined.

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