6. Experiment: Foreign keys, trigger, data dictionary, analytical functions

Exercise 6.1 (Sekundärschlüssel; 15 P.)

You will find a solution for exercises 5.2–5.5 in the script Diagramm_4_Lösung.sql (see repository). The use of multi-column keys conforms with the ER-model and guarantees the compliance with the cardinalty contrains. However, it complicates working with foreign keys.

Add artificial secondary keys (NUMBER) for each table in the schema similar to *Spiel* (subtypes do not get own keys). Use the new keys in the foreign key relationships now instead of the multi-column primary keys—but only if no constraint of exercise 5.2 will be lost. Use VNr, WNr, WzNr, SrNr, TNr for the key names.

Exercise 6.2 (Trigger; 25 P.)

The ER-model of exercise 5.2 contains some subtypes which are not implemented as tables but as views in the schema of exercise 6.1. Inserts, updates, and deletes regarding a subtype must therefore be spread to the supertype's table and to the table containing the additional attributes of the subtype. For simplicity, consider only the subtypes *Pokal*, *Pokalrunde*, and *Entscheidungsspiel*.

Extend the schema such that it allows working directly on the subtypes with operations, too, that cannot be automatically performed on views (see exercise 5.1). You can use INSTEAD-OF-triggers and referential actions for it.

Exercise 6.3 (Analytische Funktionen/Aggregatfunktionen; 20 P.)

Learn about aggregate functions and analytical functions (SQL Reference: SQL Functions). Use them to solve the follwoing problems. If used appropriately there should be only one access to the underlying data structures for each query.

- a) Compute the ranking with *rank* of all cities regarding their population, beginning with the biggest (cities without a population value should appear at the bottom). Then find the highest rank that appears multiply (as one query, result is a number).
- b) For each country, give the rank of Freiburg in the list of the countrie's cities (biggest first). (A second access to *city* is necessary to retrieve the size of Freiburg here.)
- c) Compute the shortest river which is the longest one on its continent.

Exercise 6.4 (Data Dictionary; 20 P.)

- a) Write a PL/SQL script view-all-methods.sql showing all function/procedure headers (name, parameter with type and return type, see USER_ARGUMENTS).
- b) Write a PL/SQL script drop-all-methods.sql that deletes all functions and procedures with the help of "Native Dynamic SQL".

Exercise 6.5 (Negation; 10 P.)

Write a SELECT-statement to show all days of the year 1956 on which *no* country declared independence. PL/SQL is not allowed here. Neither use connect by, recursive WITH, etc. Rownum or its standard equivalent ROW_NUMBER() is useful.

Exercise 6.6 (Bericht; 50 P.)

Write a consise report about the performed experiments to conclude the lab. Then pick a topic and elaborate an own problem definition therefore. Solve it and comment on the solution as well as on possible alternatives to your solution.

Each participant has to work separately on this exercise. You can arrange the deadline of this exercise with your tutor. Your report should comprise five to ten pages.

Deadline: 21.7.2010, 11h