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Arnab Chakrabarti, Rihan Hai

Implementation of Databases (WS 17/18)

Exercise 1

Due until October 26, 2017, 10am.
Please submit your solution *in a single PDF file* before the deadline to the L^{2}P system!
Please submit solutions in groups of three students.

Exercise 1.1 (Database Architecture) (14 pts)

1. Name each of the five layers in the database architecture specified in the lecture, explain the concepts handled in each layer, and the interfaces between layers.
2. The following tasks belong to different layers, sort them so that they match the architecture top-down.
   (a) buffering
   (b) logical relation and cursor management
   (c) media access
   (d) access path management
   (e) view formulation and management
3. (a) What does data independence mean?
   (b) Why is it an important feature of database systems?
   (c) How is data independence achieved in the five-layered architecture!

Exercise 1.2 (Query Languages) (16 pts)

The exercise is based on the Mondial database, whose schema can be accessed at `http://www.dbis.informatik.uni-goettingen.de/Mondial/` This database schema will be used throughout the exercises. The database dump for the corresponding PostgreSQL database as well as an installation description can be downloaded from the L2P. There you will also find a pdf file describing postgreSQL and its usage.

1. Formulate the following queries as expressions in **relational algebra** .

   (a) Codes of all African countries (the entire country must belong to Africa).

   (b) Give the names of all lakes trough which a french river flows (at least one french city must be located at the river; country code for France is F).

   (c) The name of the deepest sea.

   (d) The names of all countries to which the highest mountain belongs. Name the result relation as CountriesWithTheHighestMountain.

2. Now for the further set of tasks as stated below, formulate the **SQL queries**.

   (a) Give the codes of the countries where people speak German or English.

   (b) Give the list of all languages spoken in countries where Buddhists live.

   (c) Give the list of all rivers, not sourcing in Europe

   (d) Give the list of countries, the name of their lakes and the name of their mountains. Include countries that have mountains but no lakes and vice versa, but do not include countries that have neither mountains nor lakes.

Sample examples for the notation in Relational Algebra as well as SQL can be found at `http://www.databasteknik.se/webbkursen/relalg-lecture/`).

[0] `https://www.dbis.informatik.uni-goettingen.de/Mondial/`