Foundations of Information Management  
WS 16/17  
Exam Preparation

These are exam preparation exercises, which will not be discussed in the exercise class. If you like, you can hand in your solution (or part of it) until 18.01.2017. Of course, you can ask questions in the exercise class or via mail (engelsc@cs.uni-bonn.de) if you have problems concerning specific tasks.

Exercise 1 (SQL Queries). Let’s consider a schema about kids and their Christmas wishes:

- child: CID, name, age, address
- present: PID, description, type, price
- wishes: child, present
- address: AID, street, city, country

As before, CID, PID and AID are unique identifiers for children, presents and addresses and form the primary keys in the respective relations. They are referenced by child, present and address as foreign keys. In the following, ’pet’, ’book’, ’toy car’ and ’doll’ are types of presents. Note that each child can have multiple wishes.

Formulate the following questions as SQL queries:

a) How old is Jane Doe?

b) What is the price of a football?

c) Who wants to have a pet?

d) Who lives in Baker Street, London?

e) Who has more than one wish?

f) Who wants to get a book and a toy car for Christmas but nothing else?

g) Which countries have no doll among the childrens’ wishes?

h) Which presents are on the childrens’ wish lists all over the world (i.e. in each country)?
Exercise 2 (Aggregate functions). Now formulate the following questions as SQL queries using aggregate functions like \texttt{MIN}, \texttt{MAX}, \texttt{SUM} and \texttt{COUNT}:

a) How old is the youngest child?

b) Which is the most expensive/the cheapest present?

c) What is the average cost of a doll?

d) How many children want to have a doll? What is the total cost of all these dolls?

e) How many countries are there in our DB (to celebrate Christmas with presents for the children)?

f) Which is the most popular present among children aged 7?

g) Which address has the most wishes associated with it? Is this also the address with the most children living there?

h) List for each country the total number and the total price of the presents.

i) What is the average number of presents per house/address?

Exercise 3 (Relational Algebra).

i) Determine the result of the following relational algebra expressions:

\[
\begin{array}{c|c|c}
\text{A} & \text{B} & \text{C} \\
1 & b & 3 \\
2 & a & 2 \\
2 & e & 4 \\
4 & e & 5 \\
\end{array}
\]

\[
\begin{array}{c|c}
\text{C} & \text{D} \\
2 & a \\
5 & c \\
6 & c \\
\end{array}
\]

\begin{align*}
a) & \quad \sigma_{\text{A}<\text{C}}(\pi_{\text{B}}(R)) \\
b) & \quad R \Join S \\
c) & \quad \sigma_{\text{C} \neq 2}(R \Join S) \\
d) & \quad \pi_{\text{A,B}}(R) - \rho_{\text{C} \to \text{A,D} \to \text{B}}(S) \\
e) & \quad \sigma_{\text{B}=\text{c}'}(R) \Join S \\
f) & \quad \pi_{\text{A,D}}(\sigma_{\text{B} \neq \text{D}}(R \Join S)) \\
g) & \quad R \Join \sigma_{\text{A} \neq \text{S,C}} S \\
h) & \quad \pi_{\text{B}}(R) \cup \pi_{\text{D}}(S)
\end{align*}

ii) Transform the relational algebra expressions from part i) into equivalent SQL queries.