Task 5.1 (SQL DDL, Views and Triggers)  
(4 Points)

Consider the following ER diagram:

The above diagram models electronic business negotiations\(^1\). It mainly consists of messages that are sent between different partners participating in an electronic negotiation.

We assume the following attribute domains and value constraints:

- *name*, *theme*, *city* and *street* are represented as strings of appropriate length.
- *content* is a long character field (represented as SQL type long).
- *messageType* can take the value ‘offer’, ‘counteroffer’, ‘accept’ or ‘reject’ (no other values should be accepted).
- The attributes *fromDate*, *toDate* and *messageDate* represent dates.
- The *status* of a negotiation is either ‘closed’ or ‘open’ (and nothing else).
- *email* is a multi-valued string attribute.
- *IDs* are integers.

a) Map the ER model to a relational database schema. Use the formal notation presented in the lecture including intra- and inter-relational dependencies.

b) Formulate appropriate SQL DDL statements to implement this model in an Oracle database\(^2\). Do not forget to define suitable constraints!

\(^1\)German: Verhandlungen
\(^2\)You can use our Oracle test database server for this. For further information see the notes at the end of this assignment.
c) Define a view `LastMessages` that lists the ID and the theme of all closed negotiations together with the name of the partner who sent the last message concerning this negotiation.

d) Define a trigger that updates the participates relationship between negotiation and partner appropriately when a message belonging to a negotiation is sent from one partner to another.

**Task 5.2 (Relational Algebra and Relational Calculus)**

(5 Points)

The following relations are given:

- `lives` with attributes `person_name`, `city` and `street`, which contains for every person the location (s)he lives,
- `works` with attributes `person_name`, `company_name` and `salary`,
- `located` with attributes `company_name` and `city`, which contains the locations for every company (i.e. a company can be located in more than one city),
- `boss` with attributes `person_name` and `manager_name`, which contains the persons that are supervised by a manager.

Define the following queries as expressions in relational algebra, tuple relational calculus, domain relational calculus and SQL:

a) Find the names of all persons, who live and work in the same city.

b) Find name and city of all persons who work for the company ‘MicRules’.

c) Find the names of all persons, who don’t work for ‘MicRules’.

d) Find the names of all managers, whose company is not placed in Munich or Hamburg.

e) Find the names of all companies, that are located in the same city as ‘MicRules’.

Note: Use the following notation to describe the projection of a tupel variable `t` onto the attributes `A` and `B` satisfying `δ(t)` in tupel relational calculus: `{t(A, B)|δ(t)}`.

For practical experience with a relational database management system we offer you the opportunity to access an Oracle DB-server via a web interface. This and the following exercise(s) contain tasks that can be solved using this DBMS. If you did not get an access ticket after the Oracle introduction you can obtain one at our chair office.

If you are inside the network of the RWTH³ you can establish an iSQL*Plus session following the instruction on the ticket. After logging in you can create and query your private schema objects without disturbing other users.

Please take a look at the slides and SQL statements from the Oracle introduction that we made available on our web page.

³If not, use a VPN client by the Rechenzentrum to get an IP from inside