Exercise 03: Relational algebra, DML and DDL

Task 1: Creating tables using the SQL Data Definition Language

In the first exercise, you thought about views that you need in order to present data for both the conceptual and external layers. Now you will be creating the conceptual layer tables in MS SQL.

a) In your database, create a `Students` table with the following attributes:
`Name` of type variable string with a maximum of 30 characters.
`Matriculation` of type integer with a maximum of 4 characters. This attribute is the primary key and cannot be negative.

b) In your database, create a `Lecturers` table with the following attributes:
`Name` of type variable string with a maximum of 30 characters. This attribute is the primary key.
`Office` of type variable string with a maximum of 30 characters. This attribute should always be specified.
`Tel` of type variable string with a maximum of 30 characters. This attribute can also be left empty.

c) In your database, create an `Events` table with the following attributes:
`Name` of type variable string with a maximum of 30 characters. This attribute is part of the primary key.
`Semester` of type constant string with a maximum of 4 characters. This attribute is part of the primary key.
`Room` of type variable string with a maximum of 8 characters.
`Lecturer` is a foreign key for the name from `Lecturers`.

d) In your database, create the `Student_in_Event` table with the following attributes and prevent a student from registering for the same event more than once.
`Student` is a foreign key for the matriculation number from `Students`.
`Event` is a foreign key for the name from `Events`.
`Semester` is a foreign key for the semesters from `Events`.
`Grade` is a decimal number with a total of 2 digits and one of the digits after the decimal point. The grade should not be less than 1 and not greater than 5.

Task 2: Insert, modify and delete tuples using the SQL Data Manipulation Language

Now make the following changes to the data in the previously created database:

a) Professor Klaus is based in room C201 and can be reached at telephone number 123. In the winter semester 2017 (ws17) and the summer semester 2018 (ss18), he holds the dance gymnastics event in room D111. In the winter semester 2018, he holds the sack race event. The room is still to be confirmed.
b) The hang-gliding and beach volleyball events are offered by the lecturer Maria in the summer semester 2017 as well as the summer semester 2018. She is based in room D120. Her events always take place at the beach.
c) The students Eva, Luise, Daniel and Dominik have the matriculation numbers 3333, 3334, 3335 and 3336. Eva was born on 1 March 1990, Luise a month later, Daniel a month after Luise and Dominik a month after Daniel.
d) Eva, Luise and Daniel take beach volleyball in the summer semester 2018
e) Dominik and Eva take hang-gliding in the summer semester 2017
f) Luise and Daniel take dance gymnastics in the winter semester 2017 and beach volleyball in the summer semester 2017
g) It's not possible to fail beach volleyball, so all students in this course should get a grade of at least 4.0.
h) Lecturer Maria has a new office in room D22.
i) Eva has moved and de-registers herself from the university. De-register Eva from all events.

Additional task: Subsequent modification of relational schemas using SQL DDL

After you have been using your database for a while, you realise that you would like to make some changes to your conceptual schema. Use `alter table` to make the following changes:

a) Add a `Date_of_birth` field of the type `date` to the Students table.
b) In a second step, you think that you also want to always force a date of birth to be specified. Change the table accordingly. What must you consider when doing so?