

EXERCISE LIST N° 5:
Database design

Exercise 1:

We are considering a company which consists of several departments. Each department is located in at most 1 building. Each employee belongs to at most 1 department. Each employee is uniquely identified by its identifier “id_employee”.

1. Which attribute is the key of the following relation, which describes the employees of the company?
EMPLOYEE(id_employee, employee_name, employee_salary, department, building)
2. In which normal form is the above relation EMPLOYEE (1NF, 2NF, 3NF or BCNF)?
3. De-compose this relation EMPLOYEE to normalize it into the following normal form.
For instance:
 - if it is in 1NF, then normalize it to 2NF
 - else, if it is in 2NF, then normalize it to 3NF
 - etc...Then, give the corresponding schema (list of tables with their attributes, underlined for Primary Keys, followed by # for Foreign Keys).

Exercise 2:

A high-school is keeping track of the sports activities of its students (badminton, football). Each student can participate in at most 1 activity offered by the high-school.
The different activities might take place in different gymnasiums/stadiums, but one activity always takes place in the same gymnasium/stadium.
The attributes which the high-school has gathered, for each student, are:
R(student_id, student_name, age, activity, gymnasium_name)

1. What are the different FD that you can find from these attributes?
2. What is the key of the relation R?
3. Give a schema in 3NF which describes well these attributes.
4. Make some “refinement” on this schema in order to save some storage space. Tip: this can involve adding an attribute...

Exercise 3:

We are designing the database of a movie theater (cinema).
Their data is currently organized using Excel files.
From these Excel files, we could gather the following attributes, that we put together in an initial relation R:

R (movie_id, movie_title, movie_duration, room_number, room_capacity, seat_type, seat_price, projection_date, start_time)

Where the cinema has multiple rooms where movies can be projected. Each room has its own capacity (number of seats). In each room, there are different types of seats, each one with a different price (the seat price depends both on the room number and the seat type).

One movie can be projected several times on the same day, and even in the same room...

N.B.: Two movies can have the same name (it happens!).

1. List the Functional Dependencies which cannot be simplified (you should get 4 in total).
2. Normalize this database into 3NF and give its resulting schema