Homework 1
Databases - 2019

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1. Explain the use of the following IS-A constraints

- disjoint/overlapping constraint
- total/partial constraint

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2. Explain the difference of aggregation in E/R and UML.

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3. Create an E/R diagram that suits the following scenario. Use *min*...*max* notation. Explain your main design choices and describe relevant constraints.

A management system for preschools: All preschools have a unique name, a telephone number and an address. Every preschool has one principal. Employees are persons. Every person is assigned a unique identifier and we store first and last name, the date of birth, the gender and address. For employees we additionally record the social security number. Every employee works for precisely one preschool. Addresses are stored in a separate table. They consist of street name, house number, zip code and city. Each address is assigned a unique identifier. Also job functions, such as secretary, helper and teacher, are stored in a separate table. Every job function has a unique title and a salary scale. We want to store which function could be filled by which employee. Note that an employee could be qualified for multiple functions.

Every preschool consists of at least 2 groups. Each group consists of at least 10 and at most 25 children. Every group has an identifier that is unique within the preschool. For every group we store the room and age group (a certain minimum age to a maximum age) that this group is suitable for. Every employee works for precisely one preschool, but within this preschool he/she can work for different groups. For the salary payment it is necessary to store for every employee, how many hours per week he/she has worked in what position and in which group. Children belong to precisely one preschool group; they are also persons. For every child we store an up-to-date picture. For children with siblings we also record who are their siblings. To reach parents or grand parents

in case of emergencies, we store for every child a list of telephone numbers. For each child, these emergency phone numbers are ordered by importance, and we store the name of the person corresponding to the phone number.

For every child there is the choice of different care programs: e.g. there is the 'morning program' where the child visits preschool from 7 to 12 o'clock, and there is the 'half day' program from 7 to 14 o'clock. Every care program has a unique name, and we store the begin and the end time. Moreover, we store which child is assigned to which care program. Every child can be assigned to only one care program at a time. However, is possible to change the program per month and year. For example it should be possible to express that a child visits the care program 'morning' from January 2020 to March 2020 and 'half day' from April 2020 to December 2021.

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4. Create a relational schema for the conceptual model developed in the previous task. Use the *relation(key,foreign key → table,...)* notation. Also annotate nullable and unique attributes. Explain which constraints from the conceptual model cannot be expressed in the relational model.