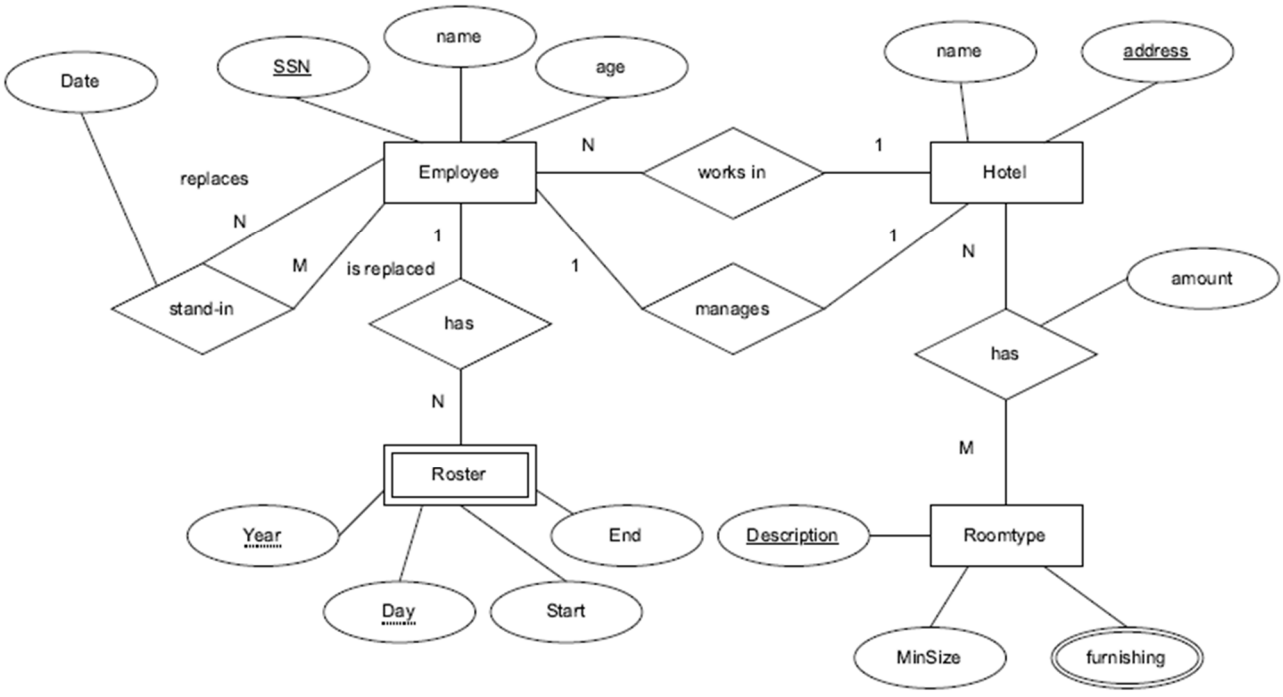
You should work on the following assignments in fixed teams of two. Please note that *every* team member must be able to explain *all* solutions of the team of two. Please submit only one solution in our moodle room for each team of two. The submission must be a PDF file with the name and matriculation number. Solutions must be in digital format with intermediate steps and detailed explanations. You can use any drawing tool of your choice to create the diagrams. If you have questions or need any support, help each other, and use the forum in our moodle room.

It is recommended that you also familiarize yourself with the assignments that do not have to be submitted and will be worked on during the lab to allow a more effective participation.

Deadline to upload your solution for assignments 1, 2, 3, and 4:
Friday, 11:59 pm bevor the laboratory.
The remaining assignments can be done during the laboratory.

Assignment 1: Relational Model for a Hotel

A hotel chain wants to use a database to keep track of their hotels and employees, described in the following ERD:



In addition to the constraints in the ERD, take account of the following constraint: “Every stand-in is uniquely identifiable by the combination of the employee who replaces, the employee who is replaced and the date of the stand-in.”

Convert the ERD into a relation schema. Make sure that every relation is in 3NF.

Assignment 2: Functional dependencies and normalization of a Furniture Database Version 1

A furniture company maintains a database that records information about orders, customers, and products. Note: In version 1, each order contains only one product. The sample database relation **ORDER** is as follows:

CustomerID	Name	Address	OrderID	Product	Quantity	Price
24	Maria Müller	Wegstraße 12b, Berlin	101	Table	2	150.00
24	Maria Müller	Wegstraße 12b, Berlin	102	Chair	5	80.00
18	Klaus Schmidt	Hauptstraße 4, Hamburg	103	Table	1	130.00
16	Petra Wagner	Lindenallee 7, Munich	104	Sofa	2	200.00

1. Determine the (full) functional dependencies. Keep in mind that functional dependencies are determined by the model, not just by the actual data in the database relations.
2. Determine potential candidate keys and a primary key for the given relation **ORDER**. Elaborate on your answer.
3. Transform the relational schema to 3NF. Your relation(s) should indicate PKs & FKs and contain all the data.
4. Create an entity relationship diagram of the 3NF schema.

Assignment 3: Functional dependencies and normalization of a Furniture Database Version 2

A furniture company maintains a database that records information about orders, customers, and products. Note: In version 2, each order may contain several products. The sample database relation **ORDER** is as follows:

CustomerID	Name	Address	OrderID	Product	Quantity	Price
24	Maria Müller	Wegstraße 12b, Berlin	101	Table	2	150.00
24	Maria Müller	Wegstraße 12b, Berlin	101	Chair	5	80.00
18	Klaus Schmidt	Hauptstraße 4, Hamburg	103	Table	1	130.00
16	Petra Wagner	Lindenallee 7, Munich	104	Sofa	2	200.00

1. Determine the (full) functional dependencies. Keep in mind that functional dependencies are determined by the model, not just by the actual data in the database relations.
2. Determine potential candidate keys and a primary key for the given relation **ORDER**. Elaborate on your answer.
3. Transform the relational schema to 3NF. Your relation(s) should indicate PKs & FKs and contain all the data.
4. Implement the schema in your database and insert sample date.

Assignment 4: Functional dependencies and normalization of a Sale Database

A university stores information about the quantities of copies of lecture notes sold by each professor. Lectures are taught by different professors, using different lecture notes.
The following sample database relation **SALE** is used:

SALE	lectId	lectName	profId	profName	noteId	price	quantity
	24	DB	47	Miller	5	32	12
	24	DB	272	Adams	1	35	15
	24	DB	251	Meyer	5	32	17
	25	Java	47	Miller	3	22	19

1. Determine the (full) functional dependencies. Keep in mind that FDs are determined by the model, not just by the actual data in the database relations.

2. Identify a primary key for the given relation **SALE**. Explain your answer.

3. Transform the relational schema to 2NF. Your relation(s) should indicate PKs & FKs and contain all the data.

4. Transform the relational schema to 3NF. Your relation(s) should indicate PKs & FKs and contain all the sample data.

Assignment 5: Functional dependencies and normalization for a general example

Consider the following relation **ANY**:

ANY (aid, bid, cid, aName, bName, cName, since, description, location)

and functional dependencies **F** that hold over the relation **ANY**:

aid	→	aName
aName	→	aid
bid	→	bName, location, cid, cName, description
cid	→	cName, description
cName	→	cId
aName, bid	→	aid, bid, cid, aName, bName, cName, since, description

1. Determine all candidate keys (possible primary keys) of **ANY**.
2. In which normal form is the relation **ANY** and why?
3. If relation **ANY** is not in 1NF, 2NF or 3NF then decompose it, accordingly, taking care to denote possible keys (both PKs and FKs).