



## **Exercise Sheet 2: Data Modelling I (until Thursday, 02.11.2017) – 38 Points**

**Please note:** you need **50%** of all exercise points to receive the *Studienleistung* for this lecture. In order to pass the RDB I Module, you need both the *Studienleistung* **and** you need to pass the exam. Exercises have to be turned in until **Thursday before the lecture** either in the lecture hall or into our mailbox (Informatikzentrum 2<sup>nd</sup> floor). Please do not forget your **Matrikelnummer** and your **tutorial group number** on your solutions. Your solutions may be in German or English. Unless otherwise specified: **Always use your own words!**

### **Exercise 2.1 – General questions (8 Points)**

- Explain the concepts of physical and logical data independence. (2 points)
- Explain the concept of universe of discourse and provide an example (2 points)
- Explain the term data model and explain each of its parts (3 points)
- Why schema integration is difficult?(1 point)

### **Exercise 2.2 – ER Modelling (8 Points)**

- Given the dog Snoopy, is it an entity, an entity type or could be both? (1 Point)
- Explain the differences between an **entity** and an **entity type** with an example (3 Points)
- Classify the address attribute of a Person entity type with respect to the three classifications for ER attributes introduced in the lecture (3 Points)
- Why do we need **key** attributes? (1 Point)

### **Exercise 2.3 (3 Points)**

Give an example ER diagram of a weak entity and its corresponding strong entity. The weak entity should have an own key attribute. Also provide a textual representation of all entity types in the ER diagram. **Note:** the example must be different to the ones presented in the lecture.

### **Exercise 2.4 (5 Points)**

Create an ER diagram (Chen) for the following scenario:

You have to model an international company database that works in the Self-Driving car industry. There are teams –uniquely identified by their country– that work on projects. Each team can have a minimum of three members and up to 7. Each member of a team is identified by a user id. For each member, we need to store name, birthday, age, e-mail and three telephone numbers (mobile, home, office). For each project, there is a unique id, a name and we are also interested in the date where the project was initiated by a given team. Each team can work on one and up to 3 projects. A project can only be carried out by one team.

### Exercise 2.5 (6 Points)

Create an ER diagram (Chen) for the following scenario.

Your task is to model a database for the company Deep ACME. The company has a system that allows employees to submit reviews on current scientific trends related to Deep Learning. Each employee is identified by a unique id, and the following information needs to be stored for each of them: full name, age, and years working for the company. Employees work in a specific department within the company. Each department is uniquely identified by an id, has a name and the year when the department was created. For each review we need to store: a unique id of the review, a summary –a text fragment –, date when the review was written and a citation. Each citation has unique identifier, an ISSN identifier of the journal or the proceedings where the article was published, publication date, title of the article, and the main keywords that further describe the citation. Each citation can have at least 3 and up to 7 keywords. To organize the citation's keywords, the company has already designed a catalog of keywords that users can choose from. Each keyword is identified by a unique id with its corresponding word.

### Exercise 2.6 (8 Points)

Create an ER diagram (Chen) for the following scenario. **Please note all integrity constraints that cannot be modelled in the diagram.**

Your job is to model university database that can be used to analyze the German university landscape. Each university is identified by its name. Additionally they can have an address and a phone number. A university belongs to one of the 16 states of Germany.

Universities offer at least 5 different courses of study, which is identified by a name that is unique within each university.

Students can have a name, gender, date of birth, and an address. For some students, also the telephone number has been saved. Each student in the database is matriculated at at least one university. At each university he is matriculated at, he is identified by a matriculation number which is unique within this university. However, students are not allowed to study at universities that belong to different states.

If a student is matriculated, he also has to be part of some course of study offered at this university.