Databases Bachelor IK-AI-IN, 2010

Assignment 1 - Databases and ER-diagrams

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Course URL	http://www.science.uva.nl/COLNET/teaching/2010-db-ik-ai-in
Hand out date	Monday, February 1
Deadline	**Friday, February 12**

Please answer the questions of this assignment and submit your answers either on paper or as a "soft" version (i.e. a Word / PDF document sent by e-mail) to the course assistants. This assignment must be done individually by students. The assistants may ask you some questions about the assignment.
Notes:
- It is the students' responsibility to check that the assistants received the submitted assignments.
- Some questions are required only for IK or IN, etc. as labeled.
- Your answers to the questions should be provided in *English.*

Question 1

There is a number of data abstraction levels defined for databases. Draw a diagram and give a short definition for these levels.

Question 2

Provide definitions to the following concepts (two or three sentences for each definition are enough):
2.1. DBMS
2.2. DBA
2.3. DML
2.4. DDL
2.5. Data Model
2.6 (only IK and IN). Normalization
2.7 (only IK and IN). Query processing
2.8 (only IK and IN). Query optimization

Question 3

Choose one application area (not exemplified in the book) e.g. a supermarket, explain how you can design a database for this application area. Draw a diagram specifying each phase of the database design.

Question 4

Suppose that there is a **construction company** that works on many projects. This company has a number of departments each working on a member of specific projects. Assume that you are hired by this company as a DBA and are provided with the following information necessary to design and develop the company's database:

• The Company is constituted by a number of **departments**. Each department is represented by a *unique name* and a particular employee who manages the department, i.e. its *manager*. The *start date* of employment (as a manager) for every manger is recorded. Every department may have several *locations*.

• Every department is involved into a specific subset of all company's construction **projects**, from which it receives financial support. Every project has a unique *name*, *number*, and a single *location*. Every project is *controlled* by one of the departments which are involved in it. Projects are of two main kinds of road construction, characterized by the length of the road, and building construction, characterized by the number of floors.

• Company stores information about its **employees**. Each employee's *name*, *ssno*, *address*, *salary*, *gender*, and *birth date* are recorded. Every employee is assigned to only one department, but he/she may be asked by the company to work on the projects of its department as well as some projects, in which his/her department is not involved. The number of *hours per week* that an employee works on each project is recorded.

• The details about employee's dependents (i.e. family members) are also recorded (e.g. for health insurance purposes). Family members are represented by the dependent's *name*, *birth date*, and the *relationship* to the employee.

Considering the descriptions given above, draw an **ER diagram** for the database, including entity sets, attributes, and relationship sets. Please pay attention to clear identification of different kinds of attributes (e.g. composite, multi-valued, derived, and primary keys) and the mapping cardinalities and the total participation for each relationship set.

Specifically your diagram may include the elements addressed below. In case some of these elements are absent in your diagram, please **explain why** (i.e. provide this explanation as a part of your answer).
In front of each element below, please list the name(s) of all relevant concepts from your ER diagram.
4.1. Entity sets
4.2. Generalizations of the unique entity sets
4.3. Relationship sets
4.4. (Only IK) Roles (when needed to clarify the semantics of the relationship)
4.5. Attributes for entity sets
4.6. Primary keys
4.7. Composite attributes
4.8. Multi-valued attributes
4.9. Derived attributes
4.10. Total participation for the relationship sets
4.11. Attributes for the relationship sets
4.12. (Only IK) Mapping cardinalities for the relationship sets (when needed to clarify the cardinality of entities involvement in relationships)
4.13. Weak entity sets
4.14. Weak relationship sets

Points	IK	AI	IN
Assignment 1 - Databases and ER-diagrams	**20**	**23**	**19**
Question 1	**2**	**3**	**2**
Question 2	**4**	**2.5**	**4**
2.1	0.5	0.5	0.5
2.2	0.5	0.5	0.5
2.3	0.5	0.5	0.5
2.4	0.5	0.5	0.5
2.5	0.5	0.5	0.5
2.6	0.5	-	0.5
2.7	0.5	-	0.5
2.8	0.5	-	0.5
Question 3	**2**	**3**	**2**
Question 4	**12**	**14.5**	**11**
4.1	1.5	2	1.5
4.1	1	2	1
4.3	1.5	2	1.5
4.4	0.5	-	-
4.5	1	1	1
4.6	1	1	1
4.7	0.5	1	0.5
4.8	0.5	1	0.5
4.9	0.5	1	1
4.10	1	1	1
4.11	0.5	1	0.5
4.12	1	-	-
4.13	1	1	1
4.14	0.5	1	0.5