

EXAM
TDDD81 Database technology
TDDD12 Database technology

October 17, 2016, 8.00-12.00

Help

No help such as dictionary, calculator, notes, books, etc. is allowed.

Grades

You can get max 30 points. To pass the exam, grade 3, you need 7.5 and 7.5 points in the practical and theoretical parts of the exam, respectively. For grade 4 and 5, you need 21 and 27 points, respectively.

Questions

Jose M. Peña will be available by phone.

Instructions

You can answer in Swedish or English. Write clearly. Give relevant and motivated answers only to the questions asked. State the assumptions you make besides those in the questions. None of these additional assumptions should change the spirit of the exercises.

Good luck!

Practical part (15 points)

Question 1. Data modeling with EER diagram (5 p):

We want to create a database to store information about the allergies a group of people suffer. Specifically, we want to store the allergies each person has. For food allergies, we want to store the ingredient that causes the allergy as well as the products that contain such an ingredient, so that the person is aware of them when shopping. We also want to store the family relations that may exist between these people: Who is married to whom, and who is parent to whom.

Draw an EER diagram for the description above. Feel free to add the attributes that you consider necessary. Clearly write down your choices and assumptions in case you find that something in the information above is not clear.

Question 2. MySQL (1 + 2 + 2 = 5 p):

Consider the Jonson Brothers' relational schema used in the labs. The following relations should suffice to answer the queries below. However, you are free to use any other relation in the relational model used in the labs.

Relation: jbemployee

An employee is identified by an id and described by name, salary, birthyear and startyear. The id of the manager of each employee is also supplied. A null value means that the employee has no manager.

Relation: jbitem

An item is identified by an id and described by its name, the department where it is sold, its price, the quantity on hand (qoh) and the identifier of the supplier that supplied it.

Relation: jbsupplier

A supplier (of items and parts) is identified by its id and described by its name and the city in which it is located.

Relation: jbparts

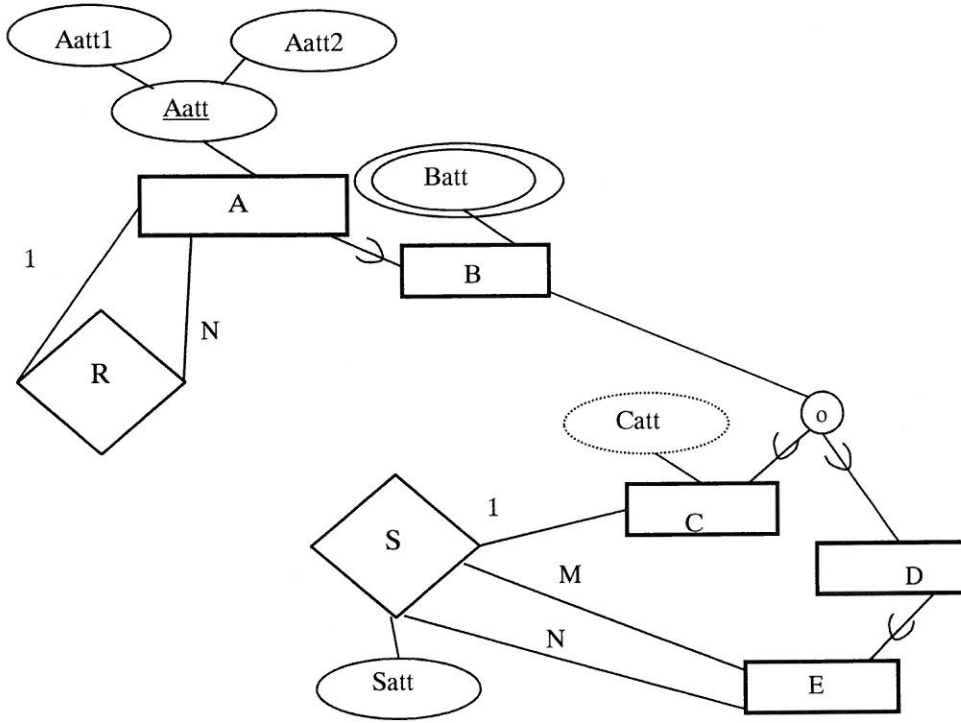
A part, used internally by the store, not sold to customers, is identified by its id and described by its name, color, weight, and the quantity on hand (qoh).

Produce the MySQL code to answer the following queries:

1. What was the age of each employee when they started working (startyear)?
2. Which items (note items, not parts) have been delivered by a supplier called Fisher-Price? Formulate this query using a subquery in the where-clause.
3. What is the name and color of the parts that are heavier than a card reader? Formulate this query without using a subquery in the where-clause.

Question 3. EER diagram and relational schema (5 p):

Translate the EER diagram below into a relational schema. Use the algorithm you have seen in the course.



Theoretical part (15 points)

Question 4. Normalization (1 + 1 + 1 = 3 p):

Describe the Boyce-Codd normal form (do not give examples, just describe it in general terms). Describe the purpose of normalizing relations, and give an example to illustrate it.

Question 5. Data structures (2 + 2 + 1 = 5 p):

Describe multilevel indexes (do not give examples, just describe them in general terms). Describe the purpose of creating an index. Describe the maintenance costs associated with having an index.

Question 6. Transactions and concurrency control (2 + 2 = 4 p):

Describe the two-phase locking protocol (do not give examples, just describe it in general terms). Describe the purpose of the two-phase locking protocol.

Question 7. Database recovery (2 + 1 = 3 p):

Describe the redo/undo recovery method, i.e. immediate update 2 (do not give examples, just describe it in general terms). Give one reason why the system may crash.

