

Exam IIS/Databases
February 2, 2012
09-12 AM

Remarks:

- Write readably and clear, using a black or blue pen
- You may offer your answers in Dutch or in English
- Write at the top of the first page all relevant data, such as your name, student number, affiliation (TM, TBK, or CS), and the total number of pages. Number all of your pages!
- The exam is "closed book"
- Always motivate your answers!

Question1 (ORM modelling, R-Map; 70 points)

Our Universe of Discourse (UoD) pertains to an information system (IS) used by a bank to maintain details about its branches. In the IS, we keep track of employees and clients of each branch. A branch is identified by a name (its reference mode). Each branch is located in some city, and offers one or more services; a service can be offered by more than one branch. Branches have employees, and an employee is referred to by a number, and has a name. We also maintain information about the department the employee works in, and phone numbers (home and work) at which an employee can be reached. Employees have at most one phone number at which they can be reached at home, but if they have a home phone number listed in the IS, then they also must have a work phone number listed in the IS. Phone numbers of an employee at home and at work can never be the same. Each employee has some phone number by which he can be reached.

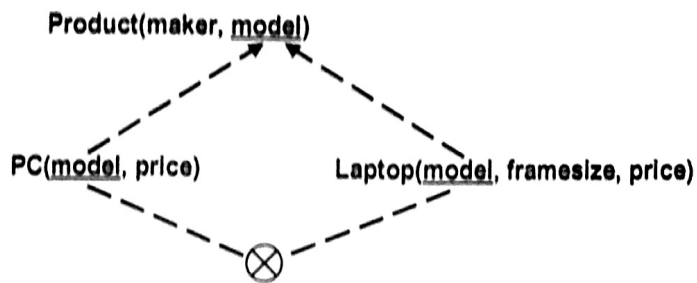
We have exactly two departments: Savings and Loans, and each employee works in some department (but not in both). We also keep track of the manager of an employee; each employee has at most one manager. If an employee belongs to some department, then the manager of that employee also belongs to that department.

Clients of the bank are referred to by a number, but can also be identified by the combination of their name and an account number. Clients can have more than one account (but never more than 3) and an account can have more than one client (but never more than 2). Loan accounts and savings accounts can never have the same number. Each account has exactly one balance.

- i) Construct an ORM model of the UoD as described above. Make systematic use of the CSDP method for constructing the model. Be precise in your choice of reference modes for each entity involved. Make sure that you capture all relevant constraints, and describe them accurately in the model.
- ii) Map the ORM model to a relational schema, using the RMap-procedure.

Question 2 (Relational model, SQL; 30 points)

Consider the following relational schema



Keys are underlined, and the dashed arrows indicate foreign key constraints. We also have the constraint that PC model values must always be different from Laptop model values. Prices are in euro's, and frame size is in inches.

Specify in SQL the following query statements

- "List all makers that only make Laptops with frame size equal to or larger than 17 inches, and that make no PC's"
- "For each maker of PC's that also makes Laptops, but only makes Laptops with a frame size smaller than 17 inches, give the minimum price of their Laptops"