University of Sussex   Autumn 2017
Informatics

Databases Assignment 1 (Deadline 26.10.17, 4pm)

The coursework assigned below must be submitted as E-submission in one single pdf file *on StudyDirect by 4 pm on Thursday, 26 October 2017. Note that no other formats than pdf will be accepted (so please save any Word documents as pdf before submission).*
You are not allowed to share or discuss solutions with other students. The university rules for collusion and plagiarism apply and any cases discovered will be reported and investigated. A decent presentation of your work is expected.
All <u>FOUR</u> *questions must be answered.*

1. A company selling firewood plans to create a database to control client orders. An informal description has been provided that explains what data they work with. You can find it *on the next page* in Table 1.

    (a) Provide an Enhanced Entity-Relationship Model for the company's data in form of a diagram *in Chen notation*. Identify special attributes (including keys) in the diagram and include *cardinality and participation* constraints for your relationships. There is no need to document the model unless you think something requires explanation.

    The following criteria will be used to mark your model:
    - extent to which your model is correct, minimal (no feature modelled twice), complete and expressive
    - correct use of Chen notation (including special attributes)
    - correct cardinality and participation constraints (including notation)
    - readability and presentation of your answer. You can write the diagram in any software system you like, as long as you stick to the notation used in the lectures and embed it

Specification

We have many salespeople throughout the UK to process client orders. A salesperson has a first name and a last name, a unique person identifier, an address consisting of street name, postcode and house number, and one or several phone numbers. For each salesperson we also store their monthly accumulated target of sales and their actual achieved sales of the current month (in pounds). Our client records contain a unique person identifier, a first name and last name, one or several phone numbers, and the date they were put on the database. We have clients and salespeople on record who have not been involved in an order yet.

Orders can be placed by one or jointly by several clients. Such joint collective orders can be useful to get a better price. A client always has to place their (part of an) order through one salesperson. It is possible that all clients in a collective order use the same salesperson, but they could also use different ones. Each order has its own unique order number and contains the date it has been placed, the current firewood price per cubic meter, the overall quantity in cubic meters as well as the quantities of each individual participating client (also in cubic meters). For each order we maintain one or several transportation requirements. Each of those requirements refers to one of our lorries, describing the quantity transported on it. For each order the transportation requirements are numbered 1,2,3, etc depending on how many requirements there are.

For each of our lorries we store the vehicle registration number, the make, the model, and the maximum load. Lorries will appear on the database as soon as they have been acquired.

And, by the way, a salesperson is not allowed to buy firewood from their own company through the order system described above (for that there are other means not to be modelled here).

Table 1: Description of the firewood company's business

into your pdf-submission. For scanned hand-written diagrams marks will be deducted depending on the appearance. The Study Direct website will suggest some dedicated tools which might not support all our notation, so you need to find workarounds for the specific bits of notation they don't support.

[52 marks]

2. Consider the Enhanced Entity-Relationship Diagram in Table 2 on the next page and answer the following questions by ONE sentence each. Only the first sentence will be marked. Note that attribute *total* refers to the total billing amount of an order.

   (a) Explain whether there can be an order that is neither a phone order nor a table order. [4 marks]

   (b) Which attribute, or set of attributes, uniquely identifies a table? [4 marks]

   (c) Explain whether it is possible to compute the total billing amount of all (phone and table) orders placed in one specific restaurant. [4 marks]

3. For each of the following enterprise constraints decide whether

   • it is already expressed in the Enhanced Entity-Relationship model (EER) of Table 2 on the next page

   • it is not already expressed in the EER of Table 2 on the next page but could be expressed using only features of an EER model.

   • cannot be expressed in the EER of Table 2 on the next page using only features of an EER model.

   In each case explain your answer briefly but clearly.

   (a) A table order originates from exactly one table of one restaurant. [4 marks]

   (b) Two table orders dispatched at (roughly) the same time must originate from different tables. [4 marks]
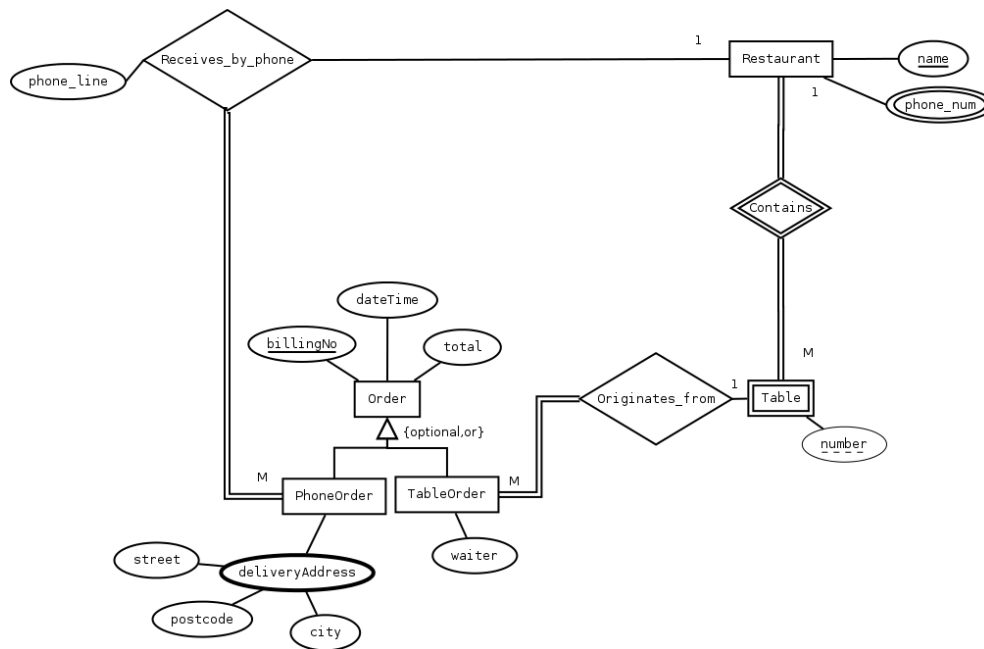
Table 2: Enhanced E/R diagram for Questions 2 to 4

4. Translate the Enhanced Entity-Relationship Diagram in Table 2 above into a *Relational Model* using the translation explained in Lecture 7.

   Present the final model (no need for explanations or intermediate steps) as a *Relational Database Schema* in textual form (see Lecture 6, Slide 16) and *not* as a diagram. Primary and foreign keys must be explicitly declared.

   [28 marks]