Practical 4 - Conceptual Design Models and $NF^2$

1. Conceptual design

The following application scenario is given:

Car models (brand name, horsepower) by certain manufactures (name, home country) are built in possibly several subsidiaries (town, country, man-power) of the manufacturer. Several car models of one manufacturer may belong to a product line (name, description). The most common model types are passenger cars (number of seats, number of doors) and trucks (number of axes, max freight), where passenger cars may be limousines, station wagons, cabrios, or sports cars.

From this description derive diagrams for the conceptual schema using the

(a) basic ER model,
(b) ER model with object-oriented extensions, and
(c) UML!

2. $NF^2$

The following $NF^2$ schema for a car retailer is given:

```
CarSales(
   Model,
   Manufacturer,
   Car(
      BuildYear,  
      Kilometers,  
      ListPrice,  
      InterestedCustomers (  
         Name,  
         LastOffer,  
         Telephones(Telephone)  
      )
   )
)
```

- Give an example relation with 3 tuples!
- What is the fully unnested relation? Is this relation in PNF?
- What could be an equivalent relational schema?
- What would the following queries be in an extended relational algebra and SQL:2003?
  - What are the list prices of Citroen’s?
  - What were the offers for a VW Beetle?
  - What are the phone numbers of Mr. Stuart, who was interested in the Ford Fiesta?