

## Homework 1

CS 435  
Fall 2000  
Craig A. Rich

- 1 Courses at a university have to be taken in a sequence in which each course has an associated set—possibly empty—of prerequisite courses that it must follow. Let the associated domain `Course_Numbers` be the set of positive integers.
  - a) Define a relation scheme for representing prerequisites.
  - b) Draw a relation instance over the defined relation scheme in tabular form.
- 2 Define a database scheme to represent information about the cars used by a company according to the following specifications. The company owns cars and also rents cars. For each car, we are interested in plate number, maker, model, and year. For owned cars, we are interested in price and date of purchase, and in all expenses for maintenance, with date and cost. For rented cars, we are interested in the renter and in the individual rental agreements, with initial and final dates and cost.
- 3 Define a database scheme for an application concerning the employment history of people, according to the following details. For each person there is interest in name, date and place of birth, and employers (companies), with initial and final dates of each employment period. Name and city are relevant for each company.
- 4 Suppose we want to represent the composition of a product in terms of parts. The product structure can be seen as a tree where, at each level, you can find a set of composed and/or simple parts. The leaves of the tree are only simple parts. Given that simple parts have an identifying code and other relevant information such as cost and weight, define a database scheme to represent the above information.
- 5 Give an appropriate designated key for each relation scheme defined in problems 1–4.
- 6 Express the minimum and maximum possible cardinality of the join of  $n$  relations  $r_1, r_2, \dots, r_n$  in terms of their individual cardinalities  $\|r_1\|, \|r_2\|, \dots, \|r_n\|$ .