CS 327 Spring 2025

Homework 2

The ER and EER models.

EXERCISE 1.

The Prescriptions-R-X chain of pharmacies has offered to give you a free lifetime supply of medicines if you design their database for them. Given the rising cost of health care, you agree. Here is the information that you gather:

- *Patients are identified by an SSN, and their names addresses and ages must be recorded.*
- *Doctors are identified by an SSN. For each doctor, the name, specialty, and years of experience must be recorded.*
- *Each pharmaceutical company is identified by name and has a phone number.*
- *For each drug, the trade name and formula must be recorded. Each drug is manufactured by a given pharmaceutical company, and the trade name identifies a drug uniquely from amongst the products of that company. If a pharmaceutical company is deleted, we need not keep track of its products any longer.*
- *Each pharmacy has a name, address and phone number.*
- *Every patient has a primary physician. Every doctor has at least one patient, and possibly several.*
- *Each pharmacy sells several drugs, and has a price for each. A drug could be sold at several pharmacies, and the price could vary from one pharmacy to another.*
- *Doctors prescribe drugs for patients. A doctor could prescribe one or more drugs for several patients, and a patient could obtain prescriptions from several doctors. Each prescription has a date and a quantity associated with it. You can assume that if a doctor prescribes the same drug for the same patient more than once, only the last such prescription needs to be stored.*
- *Pharmaceutical companies have long-term contracts with pharmacies. A pharmaceutical company can contract with several pharmacies, and a pharmacy can contract with several pharmaceutical companies. For each contract, we have to store a start date, and the text of the contract.*
- *Pharmacies appoint a supervisor for each contract. At all times, there must be a supervisor for each contract, but the contract supervisor can change over the lifetime of the contract.*

1. Draw an ER diagram that captures the above information. Identify any constraints that are not captured by the ER diagram. **[20]**

2. How could your design change if each drug is required to be sold at a fixed price by all pharmacies? **[5]**

3. How would your design change if there is the following change in the design requirements: if a doctor prescribes the same drug for the same patient more than once, several such prescriptions may have to be stored. **[5]**

EXERCISE 2.

A motor-vehicle sales company sells *motorcycles*, *passenger cars*, *vans*, and *buses*. *Model, sales-tax-rate* and *sales-volume* are attributes necessary for all kinds of vehicles. Vehicles are categorized into *commercial* and *non-commercial* vehicles. Buses and vans belong to the first category and motorcycles and cars belong to the second. For commercial vehicles we want to record the *maximum number of passengers* allowed and the *commercial vehicle tax rate*. Some kinds of non-commercial vehicles attract *luxury vehicle tax rate*. Cars alone can be of several types, such as sports car, sedan, wagon, etc.

1. Design a specialization-generalization hierarchy for this requirement. **[15]**
2. Justify your placement of attributes at each level of the hierarchy. Explain why they should not be placed at a higher or lower level. Write a small paragraph explaining everything – no need to go into great detail. **[5]**