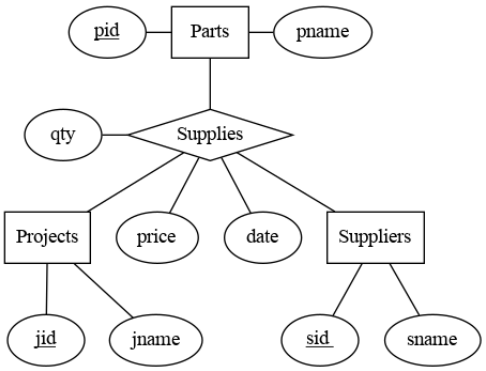
CS2102 Tutorial 3: ER Model

Wk 5, Sem 2, 2021/22

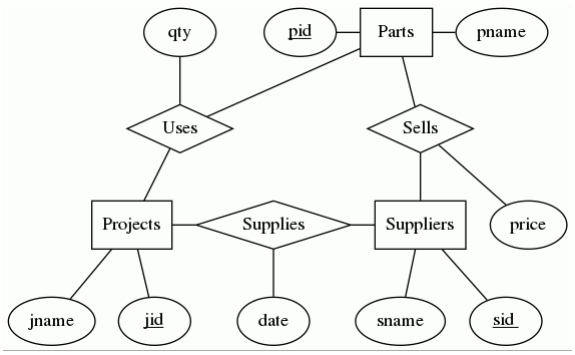
The questions that will be discussed are 1(a), 3(a), 3(b), 3(d), 3(e), and 2.

1. Consider an application about the parts (with identifier *pid* and name *pname*) supplied by suppliers (with identifier *sid* and name *sname*) to projects (with identifier *jid* and name *jname*), where *price* represents the unit price of a part, *qty* represents the quantity of a part, and *date* represents the date of a transaction.

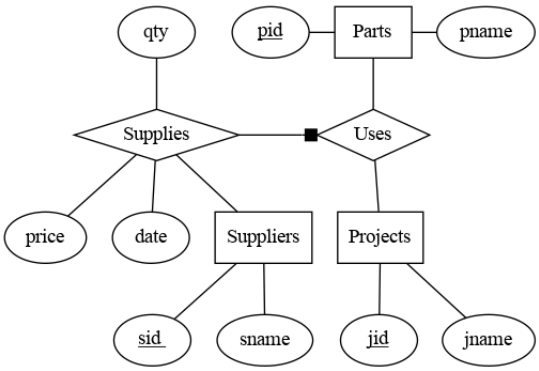
   The following are three different ER designs for the application.



(a) Design A



(b) Design B

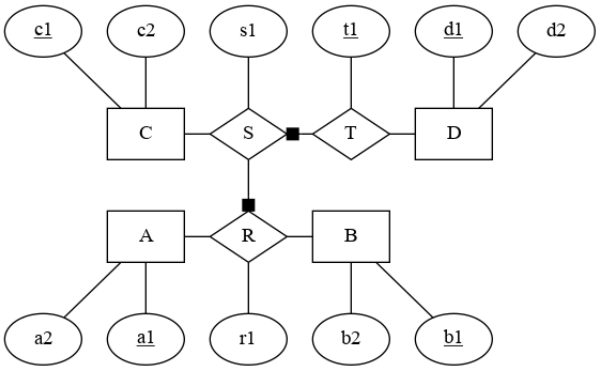


(c) Design C

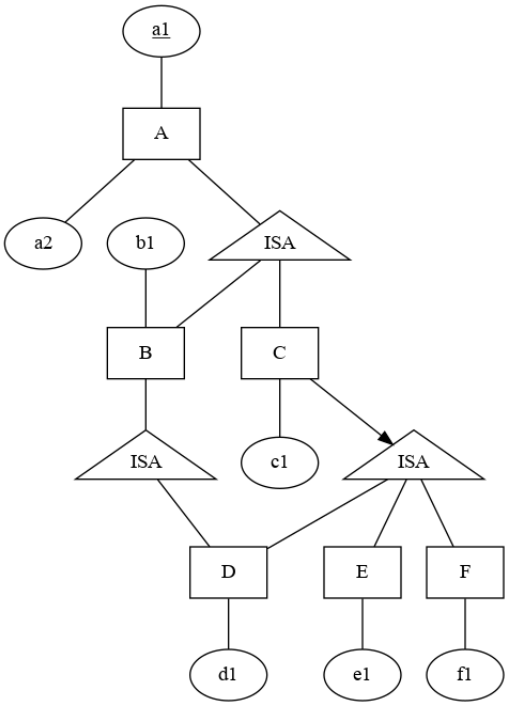
   (a) Discuss whether the designs are equivalent in the sense of capturing the same constraints of the application.

   (b) Translate each of the ER designs into a relational schema. Assume appropriate domains for the attributes.

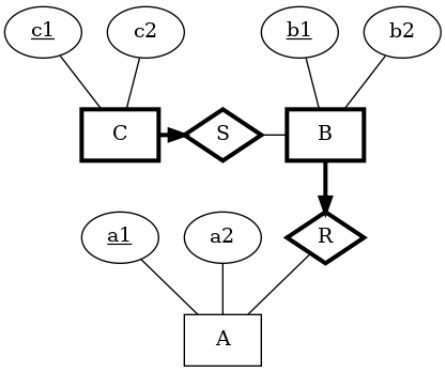
2. For each of the ER diagrams shown below, translate it into a relational schema. You may assume that all the attributes have integer domain.



(a)



(b)



(c)

3. The Prescriptions-R-X chain of pharmacies has offered to give you a free lifetime supply of medicine if you design its database. Given the rising cost of health care, you agree. Here's 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 sold by a given pharmaceutical company, and the trade name identifies a drug uniquely from among the products of that company. If a pharmaceutical company is deleted, you 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 is the primary physician of at least one patient.
   - 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.
   - There is exactly one contract between a pharmacy and a pharmaceutical company if and only if that pharmacy sells some drug that is made by that pharmaceutical company. For each contract, you have to store a start date, an end date, and the text of the contract.

   (a) Consider the ER diagram shown on the next page for Prescriptions-R-X. What are the constraints that are not captured by this design? Modify the ER design to capture as many of the constraints as possible.

   (b) Translate your ER design in part (a) into a relational schema using SQL (assume reasonable data types for the domain constraints). Your solution should capture as many of the application's contraints as possible. Identify any constraints that are not captured by your relational schema.

   (c) How would your design in part (a) change if each drug must be sold at a fixed price by all pharmacies?

   (d) How would your design in part (a) change if the design requirements change as follows: If a doctor prescribes the same drug for the same patient more than once, several such prescriptions may have to be stored.

   (e) Suppose that pharmacies appoint a supervisor for each contract. There must always be a supervisor for each contract, but the contract supervisor can change over the lifetime of the contract. Supervisors are identified by an SSN, and their start dates must be recorded. Modify your ER design in part (a) to capture this additional requirement.

(f) Translate your ER design in part (e) into a relational schema. Identify any constraints that are not captured by your relational schema.