

# National University of Computer and Emerging Sciences, Lahore Campus

- This assignment is an individual assignment.
- Clearly mention any assumption you have made.
- Show all steps, working, and reasoning to answer the questions.

## Database Systems

### BS (Computer Science) 04-May-2025

*You are required to draw **EER diagrams** for the following questions. Specify key attributes of each entity type and structural constraints on each relationship type. Note any unspecified requirements, and make appropriate assumptions to make the specification complete but clearly state your assumptions along the diagram.*

**Q1.** Suppose you are given the following information about a database for a chain of drug stores:

- a drugstore sells drugs prescribed by doctors to patients,
- each drugstore in the chain is identified by a store name, address, and a phone number,
- patients are identified by a patient id, and their names, addresses, and ages must be recorded,
- Doctors are identified by a doctor id. Each doctor's name, specialty, and years of experience must be recorded.
- Each drug is made by a pharmaceutical company and sold to the drugstore. The drug's trade name identifies the drug uniquely from among the products of that company. For each drug, the trade name and formula must be recorded
- each pharmaceutical company is identified by name and has a phone number,
- every patient has a primary doctor,
- every doctor has at least one patient,
- Each drugstore sells several drugs and has a price for each. A drug could be sold at several drugstores, and the price could vary from one drugstore 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 drugstores. A pharmaceutical company can contract with several drugstores, and a drugstore can contract with several pharmaceutical companies. For each contract, you have to store a start date, an end date, and the text of the contract,
- Drugstores 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,
- If a pharmaceutical company is deleted, you need not keep track of its products any longer.

**Q2.** Consider the following requirements for a database of a canteen:

- The canteen has a certain features of menus it can produce. Each menu has an identifying number, a name, and a price. The name is used for advertising the menu.
- Each day, the canteen offers several menus. It wants to store which menu was offered on which day and how often it was sold.
- Internally, the menus are constructed from a main course (usually meat) and several side dishes (such as soup, salad, vegetables, dessert). In this canteen the customer cannot choose the side dishes. The composition of menu is used only for the preparation, because every component (main dish or side dish) can be prepared independently. Also, if some component is used in different menus, the information about it does not have to be stored redundantly.

- For every menu component, the recipe has to be stored (how to cook this part of the meal). It is important that the type distinction (main course or sidedish) is represented and that every menu consists of exactly one main course.
- Finally, the ingredients of the menu components have to be stored (e.g. potatoes, carrots, cheese,). For each ingredient, the name and number of calories per 100g are stored. An ingredient can be used for several menu components.
- You also have to store how many grams of each ingredient are used for a menu component.

**Q3.** Consider the following requirements for a database of the fund-raising activities of a political campaign:

We keep track of all donors to the campaign. We keep track of their name, address, employers, profession, and email. A donor can have multiple employers, and we need to keep track of all of them. Each donor must have made at least one donation.

Some donors have referred other donors to us. A donor can refer many donors to us, but need not have referred any. A donor can be referred by one other donor, but need not have any referrer.

We keep track of all donations to the campaign. Each donation is from just one donor. Each donation includes the amount and the date. We also keep track of whether the donation was made by phone, by mail, or by using the campaign website. A donation is made by either check or credit card. For checks, we keep track of the bank, check number, account number, and routing number. For credit card donations, we keep track of the credit card number and expiration date.

We also keep track of events for our donors. A donor can attend multiple events, but need not have attended any. An event might not have had any donors attend yet, but might have many donors attend. For each event, we keep track of the date, location, and description. We also keep track of all tasks that a particular donor might have helped with at a particular event (for example, making food or cleaning up afterwards).