TOPIC: Conceptual Data modeling using Entity Relationship Data Model

Question 1.
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.

You are required to draw **ER diagram** for the above database. 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.

Question 2.
Suppose a group of people wants to collect useful web links. You are required to develop an **ER Model** for a database containing the following information:

- For each member of the group, we want to store first name, last name, and the email address.
- For each web page (link), we want to store the URL, and the title of web page.
- We want to manage several collections of web links, each collection dedicated to one topic e.g. one about Oracle and another one about SQL Server. For each such topic, we want to store the name of the topic, and the group member who created the topic ("topic manager").
- For each web page in our database, we want to store to which topic (or topics) it belongs.
- Members can vote on the quality of web pages by assigning them between 0 points ("trash, remove from this collection") and 10 points ("great, I really love this page").

Members can disagree on the quality of a page, e.g. one rates a page 5 while another member rates the same page 8. So potentially, we have to store the points for every combination of member and web page. However, not every member has to vote for every page.

Question 3.
A new mall, ABC Mall, just had its grand opening few months ago in Lahore, Pakistan. This new mall is attracting a lot of customers and stores. ABC Mall, which is part of a series of malls owned by a parent company, now needs a database to keep track of the management of the mall in terms of keeping track of all its stores as well as the owners and workers of the stores. Before we build a database for this system of malls, the first step will be to design an EER diagram for the mall owner. We gathered the following initial user specifications about the malls, with which we can start creating the EER diagram:

We need to record information about the mall and each store in the mall. We will need to record the mall's name and address. A mall, at any point in time, must contain one or more stores.
For each store, we will need to keep the following information: store number (which will be unique), the name of the store, the location of the store (room number), departments, the owner of the store, and manager of the store. Each store will have only one store manager. Each store is owned by only one owner. Each store is located in one and only one mall.
A store manager can manage only one store. We have to record information on the store manager: the name, social security number, which store he or she is working for, and salary. The store owner is a person. We have to record information about the store owner, such as name, social security number, address, and office phone number. A store owner has to own at least one store, and may own more than one store.
A store must have one or more departments. A department will not exist without a store. For each department we will store the department name, department number, and department manager. Each department has at least one employee working for it.
For each employee in a store, we will have to keep an employee's name, social security number, and the department in which that the employee works. Employees must work in one and only one department.

You are required to draw **EER diagram** for the above database. 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.

Question 4.
Draw an **EER diagram** that models the activities of members of a local hiking club.

The club keeps track of the mountains that they climb. For each mountain, we keep track of the mountain's name (assume all are unique), its height, and its GPS location.

We keep track of each member's MemberID, name, and DOB.

We keep track of the date when each member has climbed each mountain for the first time. Assume all members have climbed at least one mountain, and each mountain has been climbed by at least one member. And a member can climb many mountains, and each mountain has been climbed by many members.

We keep track each time a member does trailwork on a mountain. We keep track of the date and the trail for each instance of trailwork. Not all members have done trailwork, but each instance of trailwork is for one specific member.

Some members are 46ers, meaning that they have climbed all mountains. If a member is a 46er, we keep track of their 46er number and the date they became a 46er.

Other members are called Aspirants, meaning that they are not a 46er. We keep track of the date that Aspirants first contacted the organization. All members are either 46ers or Aspirants; none are both.

Some 46ers are also Correspondents, meaning that they write to and mentor Aspirants.

All Aspirants have one correspondent. Only 46ers are allowed to be correspondents, but not all 46ers are correspondents. A 46er can be a correspondent to many Aspirants. We keep track of the date that a 46er first becomes a correspondent.

We keep track of the date and message for each letter sent from an Aspirant to their correspondent. We keep track of the date and message for each letter sent from a correspondent to one of their Aspirants.