# DBA 372: Database Management Systems

## Assignment 3

1. **Explain the following terms briefly: *attribute, domain, entity, relationship, entity set, relationship set, one-to-many relationship, many-to-many relationship, weak entity set*.**

**Answer** Term explanations:

*Attribute* - a property or description of an entity. A toy department employee entity could have attributes describing the employee’s name, salary, and years of service.

*Domain* - a set of possible values for an attribute.

*Entity* - an object in the real world that is distinguishable from other objects such as the green dragon toy.

*Relationship* - an association among two or more entities.

*Entity set* - a collection of similar entities such as all of the toys in the toy department. *Relationship set* - a collection of similar relationships

*One-to-many relationship* - a key constraint that indicates that one entity can be associated with many of another entity. An example of a one-to-many relationship is when an employee can work for only one department, and a department can have many employees.

*Many-to-many relationship* - a key constraint that indicates that many of one entity can be associated with many of another entity. An example of a many-to-many relationship is employees and their hobbies: a person can have many different hobbies, and many people can have the same hobby.

*Weak entity set* - an entity that cannot be identified uniquely without considering some primary key attributes of another identifying owner entity. An example is including Dependent information for employees for insurance purposes.

1. **Consider the following information about a university database:**

**Professors have an SSN, a name, an age, a rank, and a research specialty.**

**Projects have a project number, a sponsor name (e.g., NSF), a starting date, an**

**ending date, and a budget.**

**Graduate students have an SSN, a name, an age, and a degree program (e.g., M.S.**

**or Ph.D.).**

**Each project is managed by one professor (known as the project’s principal investigator).**

**Each project is worked on by one or more professors (known as the project’s**

**co-investigators).**

**Professors can manage and/or work on multiple projects.**

**Each project is worked on by one or more graduate students (known as the project’s research assistants).**

**When graduate students work on a project, a professor must supervise their work**

**on the project. Graduate students can work on multiple projects, in which case they will have a (potentially different) supervisor for each one.**

**Departments have a department number, a department name, and a main office.**

**Departments have a professor (known as the chairman) who runs the department.**

**Professors work in one or more departments, and for each department that they**

**work in, a time percentage is associated with their job.**

**Graduate students have one major department in which they are working on their degree.**

**Each graduate student has another, more senior graduate student (known as a**

**student advisor) who advises him or her on what courses to take.**

**Design and draw an ER diagram that captures the information about the university.**

**Use only the basic ER model here; that is, entities, relationships, and attributes.**

**Be sure to indicate any key and participation constraints.**



1. **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 has 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.**

**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, you have to store a start date, an end date, and the text of the contract.**

**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.**

**1. Draw an ER diagram that captures the preceding information. Identify any constraints**

**not captured by the ER diagram.**

**2. How would your design change if each drug must be sold at a fixed price by all**

**pharmacies?**

**3. How would your design 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.**

