

## **Tutorial 5: Revision Exercise**

### **Exercise 1.**

Companies, identified by Company ID and described by Company Name and Industry Type, hire consultants, identified by Consultant ID and described by Consultant Name, Consultant Specialty, which is multi-valued. Assume that a consultant can work for only one company at a time, and we need to track only current consulting engagements.

a. Draw an ERD for this situation.

Now, consider a new attribute, Hourly Rate, which is the rate a consultant charges a company for each hour of his or her services. Now, consider that each time a consultant works for a company, a contract is written describing the terms for this consulting engagement. Contract is identified by a composite identifier of Company ID, Consultant ID, and Contract Date.

- b. Assuming that a consultant can still work for only one company at a time, redraw the ERD for this new situation.
- c. Show the dependency between attributes. Indicate the type of dependencies.
- d. Break the ERD into 3NF relation.

### **Exercise 2.**

A person may be employed by one or more organizations, and each organization may be the employer of one or more persons. An organization can be an internal organizational unit or an external organization. For persons and organizations, we want to know their ID, name, address, and phone number. For persons, we want to know their birth date, and for organizations, we want to know their budget number. For each employment, we want to know the employment date, termination date, and bonus.

Employment of a person by an organization may result in the person holding many positions over time. For each position, we want to know its title, and each time someone holds that position, we need to know the start date and termination date and salary. An organization is responsible for each position.

- a. Draw an ERD
- b. Break into 3NF

### **Exercise 3.**

Draw an ERD for the following Scenario:

A Laboratory has several chemists who work on one or more projects. Chemists also may use certain kinds of equipment on each project. Attributes of CHEMIST includes EMPLOYEE\_ID (identifier), Name, Phone\_No. Attribute of PROJECT include Project\_ID (identifier), and Start\_Date.

Attributes of EQUIPMENT include Serial\_No and Cost. The organization wishes to record Assign\_Date, which is the date when a given equipment was assigned to a particular chemist working on a specific project. A chemist must be assigned at least to one project and one equipment item. Any given equipment item need not be assigned, and a given project need not be assigned either a chemist or an equipment item.

#### Exercise 4.

At a weekend retreat, the entity type PERSON has three subtypes: CAMPER, BIKER, and RUNNER.

PERSON: SSN, Name.

CAMPER: Registration Plate.

BIKER: Serial\_No, Type.

RUNNER: Campaign Name

\* Draw a separate EER diagram segment for each of the following situations:

- a. At a given time, a person must be exactly one of these subtypes.
- b. A person may or may not be one of these subtypes. However, a person who is one of these subtypes cannot at the same time be one of the other subtypes.
- c. A person may or may not be one of these subtypes. On the other hand, a person may be any two (or even three) of these subtypes at the same time.
- d. At a given time, a person must be at least one of these subtypes.

#### Exercise 5.

The materials manager at Pine Valley Furniture Company maintains a list of suppliers for each of the material items purchased by the company from outside vendors. Table 4-7 shows the essential data required for this application.

TABLE 4-7 Pine Valley Furniture Company Purchasing Data	
Attribute Name	Sample Value
Material ID	3792
Material Name	Hinges 3" locking
Unit of Measure	each
Standard Cost	\$5.00
Vendor ID	V300
Vendor Name	Apex Hardware
Unit Price	\$4.75
Terms Code	1
Terms	COD

- a. Draw a dependency diagram for this data. You may assume the following:
  - Each material item has one or more suppliers. Each supplier may supply one or more items or may not supply any items.
  - The unit price for a material item may vary from one vendor to another.
  - The terms code uniquely identifies the terms of the sale (e.g., code 2 means 10 percent net 30 days, etc. At a given time, a supplier applies a term code. The terms for a supplier are the same for all material items ordered from that supplier.
- b. Draw an E-R diagram for this situation.
- c. Decompose this diagram into a set of diagrams in 3NF.

### Exercise 6.

Figure below shows an EER diagram for Vacation Property Rentals. This organization rents preferred properties in several states. As shown in the figure, there are two basic types of properties: beach properties and mountain properties.

- a. Diagram the functional dependencies and convert all relations to third normal form
- b. Suggest an integrity constraint that would ensure that no property is rented twice during the same time interval.

