**Chapter 4**

**Exercises**

1 A car-rental company maintains a database for all vehicles in its current fleet. For all vehicles, it includes the vehicle identification number, license number, manufacturer, model, data of purchase, and color. Special data are included for certain types of vehicles:

Trucks: cargo capacity

Sports cars: horsepower, renter age requirement

Vans: number of passengers

Off-road vehicles: ground clearance, drive train (four or two-wheel driver)

Construct schema of definition for this database. Use inheritance where appropriate.

2 Consider a database schema(Figure 2.1) with a relation Emp whose attributes are as shown below, with types specified for multi-valued attributes.

*Emp=(ename, ChildrenSet multiset(Children), SkillSet multiset(Skills))*

*Children = (name, birthday)*

*Skills = (type, ExmSet setoff(Exams))*

*Exams = (year, city)*

*Figure 2.1*

1. Define the above schema, with appropriate types for each attribute.
2. Using the above schema, write the following queries.
   1. Find the name of all employees who have a child born on or after January 1, 2000
   2. Find those employees who took an examination for the skill type “typing” in the city “Dayton”
   3. List all skill types in the relation Emp.

3 Consider the schema from Figure 2.1

a. Give DDL statements to create a relation EmpA which has the same information as Emp, but where multiset valued attributes ChildrenSet, SkillsSet and ExamsSet are replaced by array valued attributes ChildrenArray, SkillsArray and ExamsArray.

B Write a query to convert data from the schema of Emp to that of EmpA, with the array of children sorted by birthday, the array of skills by the skill type and the array of exams by the year.

C. Write an SQL statement to update the Emp relation by adding a child Jeb, with a birth-date of February 5, 2001. to the employee named George.

D. Write an SQL statement to perform the same update as above but on the EmpA relation. Make sure that the array of children remains sorted by year.

4 Suppose that you have been hired as a consultant to choose a database system for your client’s application. For each of the following application, state what type of database system(relational, persistent programming language-based OODB, object relational; do not specify a commercial product) you would recommend. Justify your recommendation.

a. A computer-aided design system for a manufacturer of airplanes

b. A system to track contributions made to candidates for public office

c. An information system to support the making of movies.

1. How does the concept of an object in the object-oriented model differ from the concept of an entity in the entity-relationship model?

Using PostgreSQL to finish the Object define and operation.