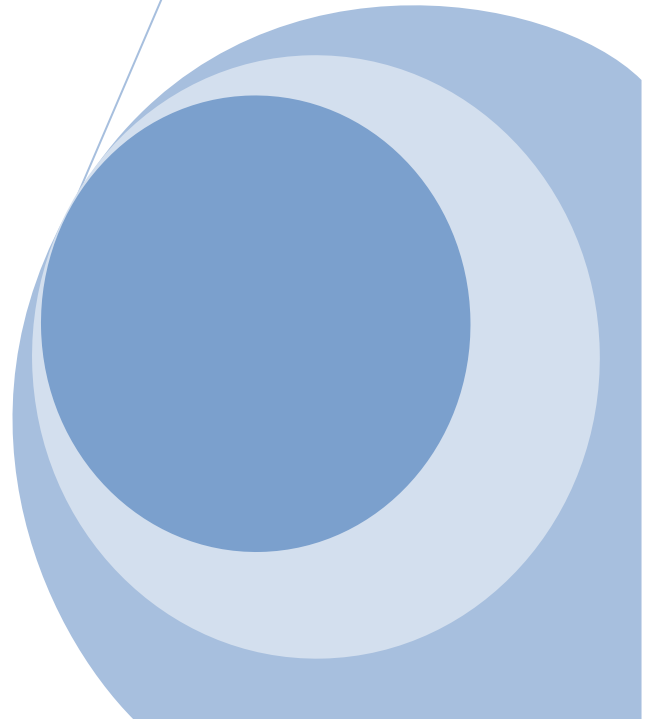
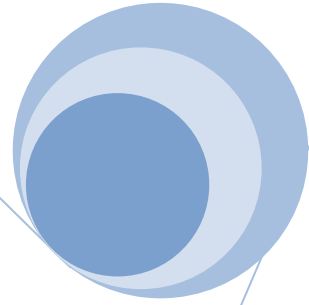


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## HOME WORK 4

Q1 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.

Answer:

```
CREATE TYPE Vehicle
    (vehicle-id integer,
     license-number char(15),
     manufacturer char(30),
     model char(30),
     purchase-date MyDate,
     color Color)

CREATE TABLE vehicle OF TYPE Vehicle

CREATE TABLE truck
    (cargo-capacity integer)
    UNDER vehicle

CREATE TABLE sportsCar
    (horsepower integer
     renter-age-requirement integer)
    UNDER vehicle

CREATE TABLE van
    (num-passengers integer)
    UNDER vehicle
```

```
CREATE TABLE offRoadVehicle
  (ground-clearance real
   driveTrain DriveTrainType)
UNDER vehicle
```

Q2 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

- a. Define the above schema, with appropriate types for each attribute.
- b. 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.

Answer:

(a) String, Date

(b). QUERIES IN SQL

1. Program: Employees who have a child born on or after January 1, 2000

```
SELECT ename
FROM emp as e, e.ChildrenSet as c
WHERE 'January 1, 2000' in
(SELECT birthday.month.day.year
FROM c))
```

2. ii. Program: Employees who took an examination for the skill type

```
SELECT e.ename
```

```
FROM emp as e, e.SkillSet as s, s.ExamSet as x
WHERE s.type = 'typing' and x.city = 'Dayton'
```

3. iii. Program; Skills types in the relation Emp

```
SELECT DISTINCT s.type
FROM emp AS e, e.SkillSet AS s
```

Q3 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.

Answer:

(A):

The schema definition is given below. Note that backward references can be added but they are not so important as in OODBS because queries can be written in SQL and joins can take care of integrity constraints.

```
CREATE TYPE Employee
```

```
    (person name varchar(30),
```

```
    street varchar(15),
```

```
    city varchar(15))
```

```
CREATE TYPE Company
```

(*company name* varchar(15),

(*city* varchar(15))

CREATE TABLE *employee* of *Employee*

CREATE TABLE *company* of *Company*

CREATE TYPE *Works*

(*person* REF(*Employee*) SCOPE *employee*,

*comp* REF(*Company*) SCOPE *company*,

*salary* int)

CREATE TABLE *works* of *Works*

CREATE TYPE *Manages*

(*person* REF(*Employee*) SCOPE *employee*,

(*manager* REF(*Employee*) SCOPE *employee*)

CREATE TABLE *manages* of *Manages*

CREATE TYPE *Employee*

(*person name* varchar(30),

*street* varchar(15),

*city* varchar(15))

CREATE TYPE *Company*

(*company name* varchar(15),

(*city* varchar(15))

CREATE TABLE *employee* of *Employee*

CREATE TABLE *company* of *Company*

CREATE TYPE *Works*

```
(person REF(Employee) SCOPE employee,
comp REF(Company) SCOPE company,
salary int)
```

```
CREATE TABLE works of Works
```

```
CREATE TYPE Manages
```

```
(person REF(Employee) SCOPE employee,
(manager REF(Employee) SCOPE employee)
```

```
CREATE TABLE manages of Manages
```

(B):

i. SELECT *comp* -> *name*

```
FROM works
```

```
GROUP BY comp
```

```
HAVING COUNT(person) < all(select count(person)
```

```
FROM works
```

```
GROUP BY comp)
```

ii. SELECT *comp* -> *name*

```
FROM works
```

```
GROUP BY comp
```

```
HAVING SUM(salary) < all(select sum(salary)
```

```
FROM works GROUP BY comp)
```

iii. SELECT *comp* -> *name*

```
FROM works
```

```
GROUP BY comp
```

```
HAVING AVG(salary) > (SELECT AVG(salary)
```

FROM *works*

WHERE *comp* -> *company name*="First Bank Corporation")

Q4 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.

Answer:

SN	SYSTEM	RECOMMENDED DATABASE SYSTEM	JUSTIFICATION
1	A computer-aided design system for a manufacturer of airplanes	Object-Oriented Database	The CAD requires complex data types, and being computation oriented, CAD tools are typically used in a programming language environment needing to access the database.
2	A system to track contributions made to candidates for public office	Relational Database	The data types are expected to be simple, and a powerful querying mechanism is essential.
3	An information system to support the making of movies	Object Relational Database	An information system to support the making of movies: Here there will be extensive use of multimedia and other complex data types. But queries are probably simple, and thus an object relational system is suitable

Q5. How does the concept of an object in the object-oriented model differ from the concept of an entity in the entity-relationship model?

Answer:

A model is a picture representation of a reality. It is a means of communicating a certain amount of knowledge in or an emphasis of selected aspects. A model can come in many shapes, sizes, and styles. It is important to emphasize that a model is not the real world but merely a human construct to help us better understand real world systems. These model are both used for conceptual design. The basic construct of this design consists of entities, attributes, and relationships.

1. An entity is simply a collection of variables or data items. An object is an encapsulation of data as well as the methods (code) to operate on the data. The data members of an object are directly visible only to its methods. The outside world can gain access to the object's data only by passing pre-defined messages to it, and these messages are implemented by the methods.