

Object-Relational Databases

Exercises

9.1 Answer:

- a. Find the names of all employees who have a child who has a birthday in March.

```
select ename
from emp as e, e.ChildrenSet as c
where 'March' in
      (select birthday.month
       from c
       )
```

- b. Find those employees who took an examination for the skill type “typing” in the city “Dayton”.

```
select e.ename
from emp as e, e.SkillSet as s, s.ExamSet as x
where s.type = 'typing' and x.city = 'Dayton'
```

- c. List all skill types in the relation *emp*.

```
select distinct s.type
from emp as e, e.SkillSet as s
```

- 9.4 Answer: For this problem, we use table inheritance. We assume that **MyDate**, **Color** and **DriveTrainType** are pre-defined types.

```
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

```

9.6 Answer:

- a. The corresponding SQL:1999 schema definition is given below. Note that the derived attribute *age* has been translated into a method.

```

create type Name
(first-name varchar(15),
middle-initial char,
last-name varchar(15))
create type Street
(street-name varchar(15),
street-number varchar(4),
apartment-number varchar(7))
create type Address
(street Street,
city varchar(15),
state varchar(15),
zip-code char(6))
create table customer
(name Name,
customer-id varchar(10),

```

```

    address Adress,
    phones char(7) array[10],
    dob date)
method integer age()

```

```

b. create function Name (f varchar(15), m char, l varchar(15))
returns Name
begin
    set first-name = f;
    set middle-initial = m;
    set last-name = l;
end
create function Street (sname varchar(15), sno varchar(4), ano varchar(7))
returns Street
begin
    set street-name = sname;
    set street-number = sno;
    set apartment-number = ano;
end
create function Address (s Street, c varchar(15), sta varchar(15), zip varchar(6))
returns Address
begin
    set street = s;
    set city = c;
    set state = sta;
    set zip-code = zip;
end

```

9.8 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

```

- 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')

9.12 Answer:

- a. A computer-aided design system for a manufacturer of airplanes :-
 An OODB system would be suitable for this. That is because CAD requires complex data types, and being computation oriented, CAD tools are typically used in a programming language environment needing to access the database.
- b. A system to track contributions made to candidates for public office :-
 A relational system would be apt for this, as data types are expected to be simple, and a powerful querying mechanism is essential.
- c. 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.