

4.12 For the database of Figure 4.11, write a query to find those employees with no manager. Note that an employee may simply have no manager listed or may have a null manager. Write your query using an outer join and then write it again using no outer join at all.

Ans: With Outer Join

```
Select employee_name  
from employee natural left outer join manages  
where manager_name is null
```

Without Outer join

```
Select employee_name  
from employee e  
where not exists  
    (select employee_name  
     from manages m  
     Where e.employee_name = m.employee_name and  
           m.manager_name is not null)
```

4.13 Under what circumstances would the query

select * from student natural full outer join takes natural full outer join course

include tuples with null values for the title attribute?

- Ans:**
1. Since course_id is a foreign key in the takes table referencing the course table, the title attribute in any tuple obtained from the above query can be null if there is a course in course table that has a null title.
 2. If a student has not taken any course, as it is a natural full outer join, such a student's entry would appear in the result with a null title entry.

4.14 Show how to define a view tot_credits (year, num credits), giving the total number of credits taken by students in each year.

Ans: create view tot_credits(year, tot_credits)
as (select year,sum(credits)
from takes natural join course
group by year)

4.15 Show how to express the coalesce operation from Exercise 4.10 using the case operation.

Ans:
case
when A1 is not null then A1
when A2 is not null then A2
...
when An is not null then An
else null end

4.17 Explain why, when a manager, say Satoshi, grants an authorization, the grant should be done by the manager role, rather than by the user Satoshi.

Ans: Consider the case where the authorization is provided by the user Satoshi and not the manager role. If we revoke the authorization from Satoshi, for example because Satoshi left the company, all authorizations that Satoshi had granted would also be revoked, even if the grant was to an employee whose job has not changed.

If the grant is done by the manager role, revoking authorizations from Satoshi will not result in such cascading revocation.

In terms of the authorization graph, we can treat Satoshi and the role manager as nodes. When the grant is from the manager role, revoking the manager role from Satoshi has no effect on the grants from the manager role

4.18 Suppose user A, who has all authorizations on a relation r , grants select on relation r to public with grant option. Suppose user B then grants select on r to A. Does this cause a cycle in the authorization graph? Explain why.

Ans: Yes, it does cause a cycle in the authorization graph.

The grant to public results in an edge from A to public. The grant to the public operator provides authorization to everyone, B is now authorized.

For each privilege granted to public, an edge must therefore be placed between public and all users in the system. If this is not done, then the user will not have a path from the root (DBA). And given the with grant option, B can grant select on r to A result in an edge from B to A in the authorization graph.

Thus, there is now a cycle from A to public, from public to B, and from B back to A