

Your Name:

(1) On the university schema, explain in natural language what the following queries do.

- `select * from courses where course_id not in (select course_id from prereq)`
- `select i.id, i.name from instructor join teaches on (id) where year = 2024`
 - *Also explain what might be an issue with the query and how to fix it*
- `select * from section s where building not in (select building from department d, course c where d.name = c.name and c.course_id = s.course_id)`
- `select d.dept_name from department d, course c where d.dept_name = c.dept_name group by d.dept_name having budget < 10000 * sum(credits)`
- `select * from instructor i, advisor a, student s, teaches t1, takes t2 where i.id = t1.id and i.id = a.i_id and a.s_id = s.id and s.id = t2.id and (t1.course_id, t1.sec_id, t1.semester, t1.year) = (t2.course_id, t2.sec_id, t2.semester, t2.year);`
- `select distinct t1.id, t1.course_id from takes t1, takes t2 where t1.id = t2.id and t1.course_id = t2.course_id and (t1.sec_id, t1.semester, t1.year) != (t2.sec_id, t2.semester, t2.year)`

(2) On University schema, consider the following 3 relations formed by joining existing relations. What should be primary key of these relations? Briefly explain.

```
Q1(ID, dept name, course id, sec id, semester, year) =  
select teaches.ID, department.dept name, course id, sec id, semester, year)  
from teaches, instructor, department  
where teaches.id = instructor.id and department.dept name = instructor.dept name;
```

```
Q2(course id, title, dept name, credits, prereq id) =  
select course.course id, title, dept name, credits, prereq id  
from course join prereq on (course.course id = prereq.course id);
```

```
Q3(dept name, building, year, num) =  
select d.dept name, d.building, t.year, count(*) as num  
from takes t, course c, department d  
where c.dept name = d.dept name and t.course id = c.course id group by d.dept name, d.building, t.year;
```

(3) Consider the following relational schema that stores information about the current vehicles and license information (i.e., no historical information). Assume each driver can only hold one license. Multiple drivers may be insured for driving a specific vehicle. Further, plate_number is not unique outside a state (i.e., the same plate number may be associated with different vehicles in different states).

- person (person_id, name, address)
- driver_license (person_id, state, license_number, issue_date, expiry_date)
- vehicle (plate_number, state, model, year)
- insured_driver (plate_number, state, person_id)

What should be the primary key for the driver_license table given the information?

What should be the primary key for the insured_driver relation?