

- Q.1.A
- $\pi_{name}(\sigma_{code=cs3020}(student \bowtie enrolledIn))$
 - $\pi_{code}(\sigma_{name='Hector'}(student \bowtie enrolledIn))$
 - $\pi_{lecturer}(\sigma_{code=cs1500}(subject))$
 - $\pi_{lecturer}(\sigma_{code=cs3020 \vee code=cs3010}(subject))$
 - $\pi_{lecturer}(\sigma_{subject.lecturer=subjectlecturer \wedge subject.code \neq subjectcode}(R \bowtie S))$
 - $\pi_{name}(\sigma_{code=cs1500 \vee code=cs3010}(student \bowtie enrolledIn))$
 - $\pi_{name}(\sigma_{code=cs1500}(student \bowtie enrolledIn)) \cup \pi_{name}(\sigma_{code=cs3010}(student \bowtie enrolledIn))$
 - $\pi_{name}(student \bowtie (\sigma_{R.code=S.id \wedge R.code \neq S.code}(R \bowtie S)))$
- S and R are the enrolledIn relation.
- $\pi_{code}(subject)$
 - $\pi_{name}(student)$
 - $\pi_{name}(\sigma_{code=cs1500}(student \bowtie enrolledIn))$
 - $\pi_{name}(\sigma_{lecturer=Rogers}(subject \bowtie enrolledIn \bowtie student))$
 - $\pi_{name}(\sigma_{lecturer \neq Rogers}(student \bowtie enrolledIn \bowtie subject))$

- Q.1.B
- ```

SELECT student.name FROM student
JOIN
enrolledIn ON student.id = enrolledIn.id
WHERE enrolledIn.code = 'cs3020';

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  - ```

SELECT enrolled.code FROM enrolledIn
JOIN
student ON student.id = enrolledIn.id
WHERE student.name = 'Hector';

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4. SELECT lecturers FROM subject
WHERE code = 'cs1500' or 'code = 'cs3020'

3. SELECT lecturers FROM subject
WHERE code = 'cs1500'

5. SELECT lecturers, group_concat(code) FROM
subject group by lecturer having count(*) > 1

6. SELECT name from students
JOIN enrolledIn on s.id = e.id
WHERE code = 'cs1500'
UNION

SELECT name from students
JOIN enrolledIn e on sid = e.id
WHERE code = 'cs3010'

7. SELECT name from students
JOIN enrolledIn e on s.id = e.id
WHERE code = cs1500
UNION
SELECT name FROM students
JOIN
enrolledIn e on sid = e.id WHERE code =
'cs3010'

8. SELECT s.name, group_concat(e.code) from
students inner JOIN enrolledIn e on
s.id = e.id GROUP by s.id HAVING count(*) > 1

9. SELECT code from subject
10. SELECT name from student
11. SELECT name from students JOIN enrolled
e on sid=e.id where code='cs1500'
12. SELECT name from subjects JOIN
enrolledIn e on sid=e.id
JOIN subject su on su.code=e.code
where lecturer='Roger'
13. SELECT name from subjects
JOIN enrolledIn e ON sid=e.id
JOIN subject su on su.code=e.code
WHERE lecturer != 'Roger'

Q.2.A

1. $\pi_{aid}(\sigma_{name = 'Boeing'}(Aircraft))$
2. $\pi_{ename}(\sigma_{aname = 'Baeina'}(Employee \bowtie certified \bowtie Aircraft))$
3. $\pi_{aid}(\sigma_{from = 'LA' \wedge to = 'NY'}(Flights \bowtie Aircraft \bowtie certified))$
4. $\pi_{ano}(\sigma_{ano = \max(ano)}(Flights \bowtie certified \bowtie employee \bowtie \sigma_{salary > 100000}(Employee \bowtie certified \bowtie flights)))$
5. $\pi_{ano}(\sigma_{salary > 100000}(Employee \bowtie certified \bowtie flights))$
6. $\pi_{ename}(\sigma_{range > 3000 \wedge aname \neq Boeing}(Employee \bowtie certified \bowtie aircraft))$
7. $\pi_{aid}(\sigma_{salary = \max(salary)}(Employee))$
8. $\pi_{aid}(\sigma_{salary = \max(salary)}(Employee - \sigma_{salary = \max(salary)}(Employee)))$
9. $\pi_{aid}(\sigma_{aid = \max(count(aid))}(certified))$
10. $\pi_{aid}(\sigma_{count(aid) = 3}(Aircraft))$

Q2.3) 1. SELECT distinct eid FROM certified
JOIN

Aircraft where aname = 'Boeing'

2. SELECT distinct ename FROM employees
WHERE

eid in (SELECT eid FROM certified
where eid in (select eid from Aircraft
where aname = 'Boeing'));

3. SELECT DISTINCT fno FROM flights WHERE
NOT EXISTS (SELECT eid FROM Employees
WHERE salary > 100000 AND NOT EXISTS
(SELECT aid FROM certified WHERE eid =
Employees.eid AND aid NOT IN (SELECT aid
FROM Aircrafts WHERE range >= (SELECT
MAX(distance) FROM flights WHERE fno =
Flights.fno))));

3. SELECT DISTINCT aid FROM certified where
aid in (SELECT aid FROM aircraft WHERE
range >= (SELECT MAX(distance) FROM flights
where from = 'LA' and to = 'NY'));

5. SELECT distinct fno. from flights, certified,
employees where salary > 100000 and flights.fno =
certified.fno and certified.eid = employees.eid
group by fno. having count (distinct certified.eid)
= (SELECT count(aid) from Aircraft);

6. SELECT DISTINCT ename FROM employees
WHERE salary > 3000 AND eid NOT IN
(SELECT eid FROM certified WHERE
IN (SELECT aid FROM Aircraft WHERE
aname = 'Boeing'));

7. SELECT eid FROM Employee WHERE
salary = (SELECT MAX (salary) FROM
Employees);

8. SELECT eid FROM Employee WHERE
salary = (select MAX (salary) FROM Employees
WHERE salary < SELECT MAX (salary) FROM
Employees);

9. SELECT eid FROM certified GROUP BY eid
order by count (aid) DESC LIMIT;

10. SELECT eid FROM certified GROUP BY
eid HAVING Count(eid) = 3;

Q.3.1. $\Pi_{name}(\sigma_{age > 25} (User))$

2. $\sigma_{id > 2 \vee age \neq 31} (User)$

3. $\sigma_{userid = occupationid = occupationid} (User \times Occupation)$

4. $User \bowtie Occupation \bowtie city$

5. $\Pi_{name, gender} (\sigma_{cityname = 'Boston'} (User \bowtie city))$

Q.4.1. $\Pi_{pizzeria} (\sigma_{age < 18} (Person) \bowtie Frequent)$

2. $\Pi_{name} (\sigma_{sender = female \text{ AND } (pizza = 'mushroom' \text{ OR } pizza = 'pepperoni')}) (PERSON \bowtie EATS)$

3. $\Pi_{name} (\sigma_{gender = female \text{ AND } pizza = 'mushroom'} (PERSON \bowtie EATS))$ \cap

4. $\Pi_{\text{pizza}}(\sigma_{\text{gender} = \text{'Any'}}(\text{Eats} \bowtie \sigma_{\text{price} < 10}(\text{Serves})))$
5. $\Pi_{\text{pizza}}(\sigma_{\text{gender} = \text{'Any'}}(\text{Eats}) \bowtie \sigma_{\text{price} < 10}(\text{Serves}))$
6. $\Pi_{\text{pizza}}(\sigma_{\text{gender} = \text{'male'}}(\text{Person} \bowtie \text{Frequent})) - \Pi_{\text{pizza}}(\sigma_{\text{gender} = \text{'male'}}(\text{Person} \bowtie \text{Frequent})) \quad \checkmark$
7. $\Pi_{\text{pizza}}(\sigma_{\text{gender} = \text{'female'}}(\text{Person} \bowtie \text{Frequent})) - \Pi_{\text{pizza}}(\sigma_{\text{gender} = \text{'female'}}(\text{Person} \bowtie \text{Frequent}))$
8. $\text{Eats} - \Pi_{\text{name, pizza}}(\text{Frequent} \bowtie \text{Serves})$
9. $\Pi_{\text{name}}(\text{person}) - \Pi_{\text{name}}(\text{Frequent} - \Pi_{\text{name, pizza}}(\text{Eats} \bowtie \text{Serves}))$
10. $\Pi_{\text{name}}(\text{person}) - \Pi_{\text{name}}(\Pi_{\text{name, pizza}}(\text{Eats} \bowtie \text{Serves}) - \text{Frequent})$
11. $\Pi_{\text{pizza}}(\sigma_{\text{pizza} = \text{'pepperoni'}}(\text{Serves})) - \Pi_{\text{pizza}}(\sigma_{\text{price} > \text{price}(\Pi_{\text{pizza}, \text{price}}(\sigma_{\text{pizza} = \text{'pepperoni'}}(\text{Serves}))) \times \text{price}(\Pi_{\text{pizza}, \text{price}}(\sigma_{\text{pizza} = \text{'pepperoni'}}(\text{Serves})))})$

Q.5. To options

corrected it



- a. $\Pi_{\text{eid}}(\Pi_{\text{eid, bid}}(\text{own}) / \Pi_{\text{bid}}(\text{Brand}))$ and
- b. $\Pi_{\text{eid}}(\text{own}) - \Pi_{\text{eid}}((\Pi_{\text{eid}}(\text{own}) \times \Pi_{\text{bid}}(\text{brand})) - \Pi_{\text{bid, eid}}(\text{own}))$