Khushveen Kaur Umra

COMS 363

9th November 2021

Homework 3.2

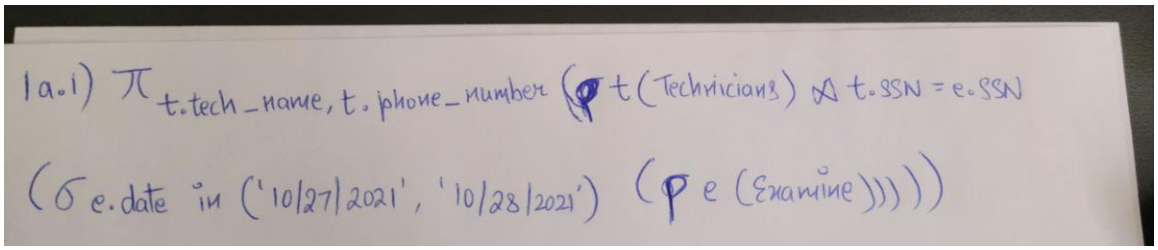
1. (50 points) Consider the following relations: Technicians(SSN, tech_name, address, phone_number), Tests(FAAid, test_name, max_score), Planes(Pid, model), and Examine(SSN, FAAid, Pid, date, score), and the following queries:

Q1: Find the names and phone_numbers of the technicians who examine a plane on 10/27/2021 or 10/28/2021;

a) Query:

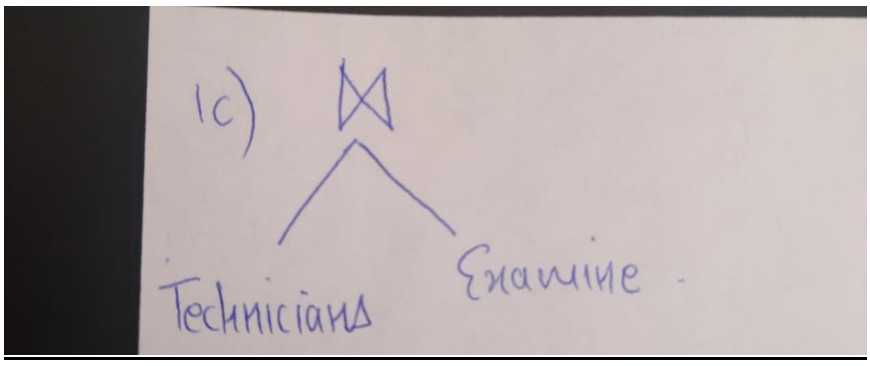
```
SELECT t.tech_name, t.phone_number FROM Technicians as t
JOIN Examine as e ON t.SSN = e.SSN
WHERE e.data in ('10/27/2021','10/28/2021');
```

a.1) **Relational Algebra Expression:**



a.2) Expression tree:

a.3) Left-deep plans: 2

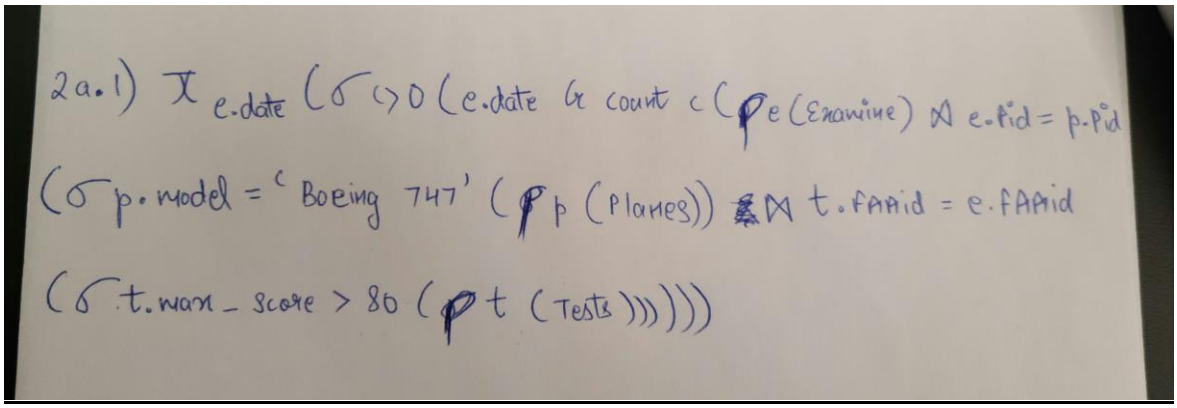


Q2: Find the date that at least one Boeing 747 plane got higher than 80% of the max scores in its tests. (Hint: Boeing 747 is a model, not a Pid);

a) Query:

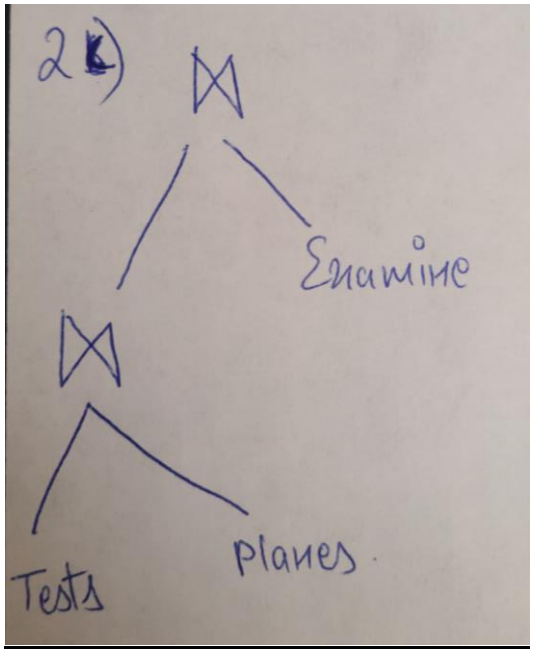
```
SELECT e.date FROM Examine as e JOIN Planes as p
ON p.Pid = e.Pid JOIN Tests as t ON t.FAAid = e.FAAid
WHERE p.model IS 'Boeing 747' and t.max_score > 80
GROUP BY e. date HAVING COUNT(*) > 0;
```

a.1) **Relational Algebra Expression:**



a.2) Expression tree:

a.3) Left-deep plans: 6

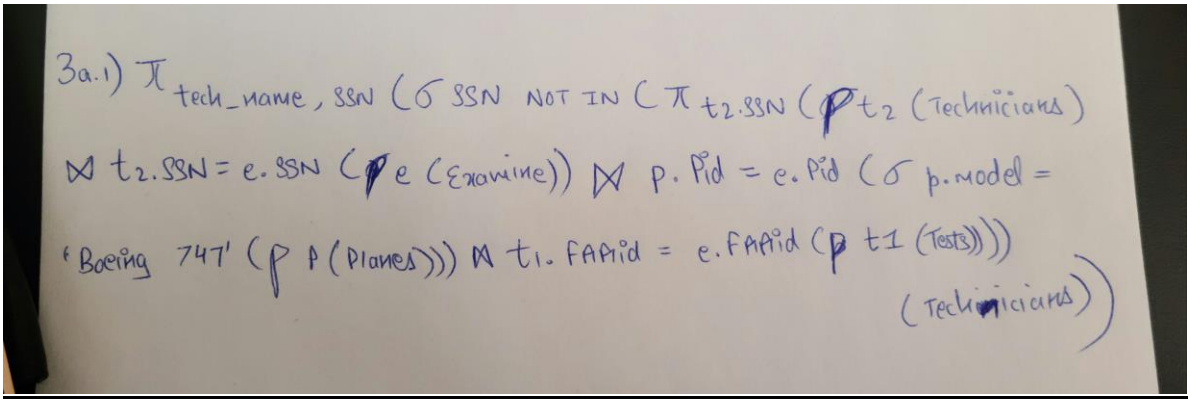


Q3: Find the name and ssn of the technicians who have not conducted any test on any Boeing 747 plane.

a) **Query:**

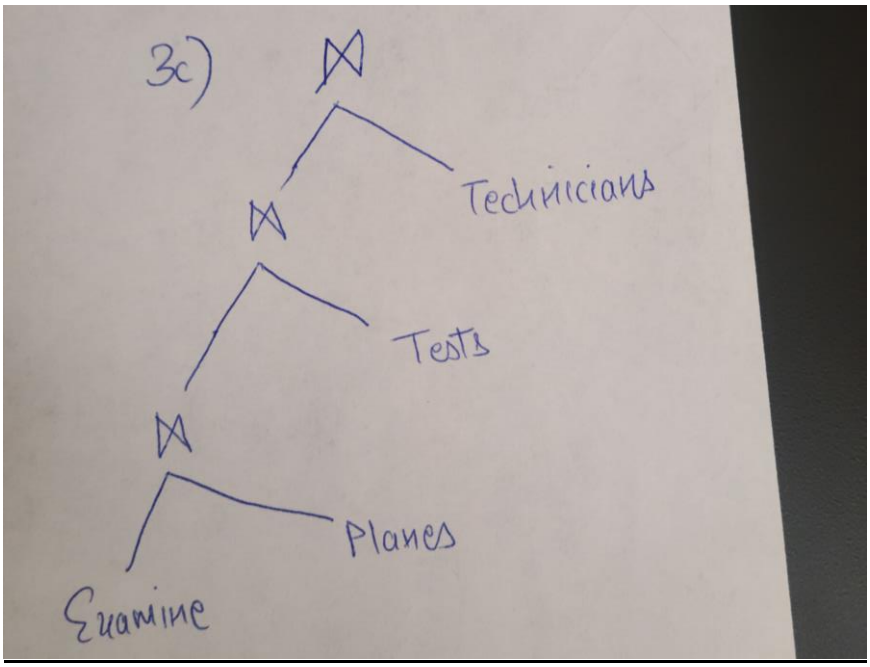
```
SELECT t.tech_name, t.SSN FROM Technicians as t

WHERE t.SSN NOT IN
 (
SELECT t2.SSN from Technicians as t2 JOIN Examine as e
ON t2.SSN = e.SSN JOIN Planes as p ON p.Pid = e.Pid JOIN Tests as t1
ON t1.FAAid = e.FAAid
WHERE p.model is 'Boeing 747');
```

a.1) **Relational Algebra Expression:**



a.2) Expression tree:

a.3) Left-deep plans: 24



a. (12 pts) For each of the queries, write a relational algebraic expression.
b. (30 pts) Draw their expression trees with selection and projection conducted as early as possible. Use left-deep joins whenever joins are needed.
c. (8 pts) How many left-deep plans are there for joining all the four tables without cross product? Write down all these plans by drawing their expression trees. (Hint: if two tables do not have a common attribute, then natural join is defined as cross product, and thus should be avoided).

Submission Instruction

You can handwrite, but please make sure it is readable. Save your work as PDF and submit through your Canvas account.