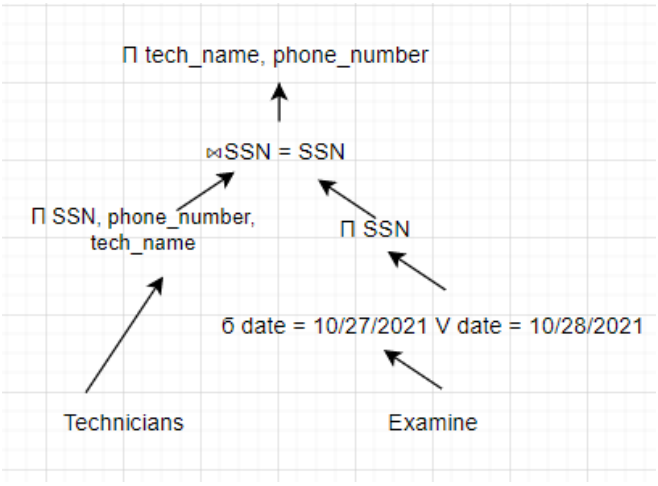
Neha Maddali

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

   a) (12 pts) For each of the queries, write a relational algebraic expression.
   Q1: $\Pi_{\text{tech\_name, phone\_number}} (б_{\text{date = 10/27/2021 V date = 10/28/2021}}(\text{Technicians} \bowtie \text{Examine})$
   Q2: $\Pi_{\text{date}} (б_{\text{max\_score > 80 ^ model = "Boeing 747"}} (\text{Examine} \bowtie \text{Tests} \bowtie \text{Planes})$
   Q3: $\Pi_{\text{tech\_name, SSN}} (\Pi_{\text{tech\_name, SSN}} (\text{Technicians}) - \Pi_{\text{tech\_name, SSN}} (б_{\text{model = "Boeing 747"}} (\text{Examine} \bowtie \text{Technicians} \bowtie \text{Planes})$
   b) (30 pts) Draw their expression trees with selection and projection conducted as early as possible. Use left-deep joins whenever joins are needed.
   Q1:



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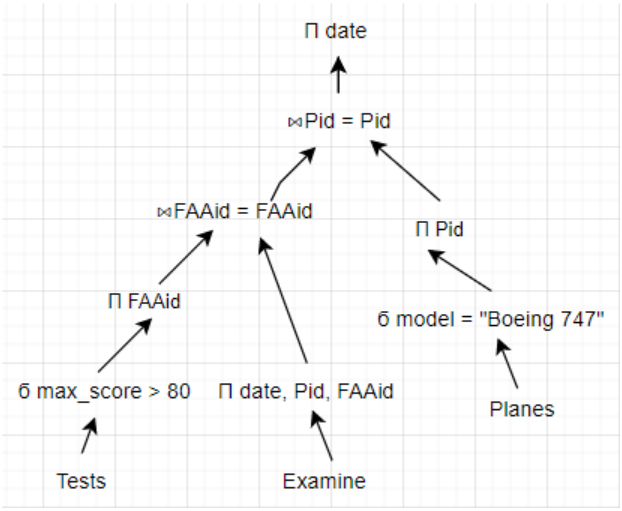

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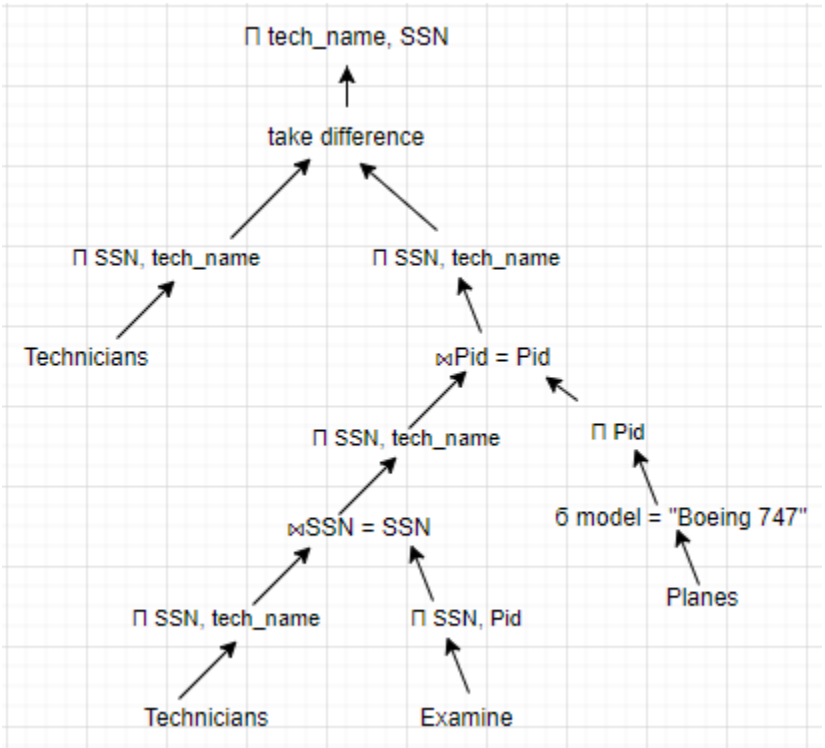
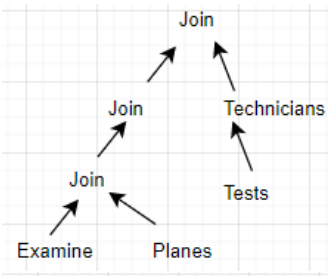


c) (8 pts) How many left-deep plans are there for joining all the four tables without cross product? Write down all these plans by drawing their expression trees. (Hint: if two tables do not have a common attribute, then natural join is defined as cross product, and thus should be avoided).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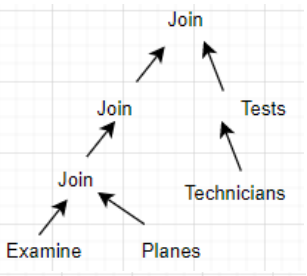
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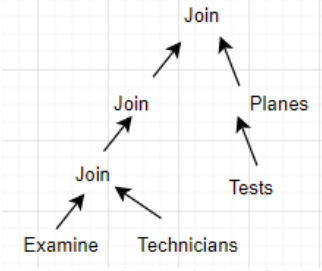
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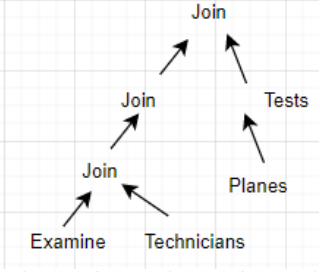
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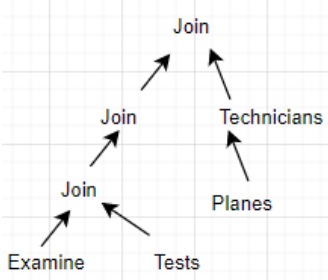
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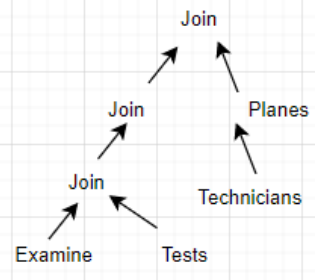
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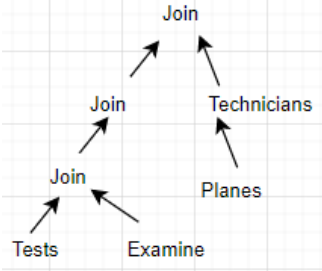
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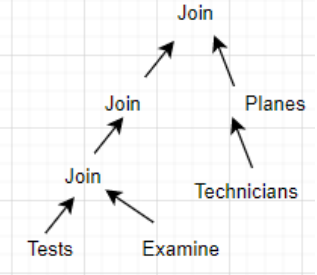
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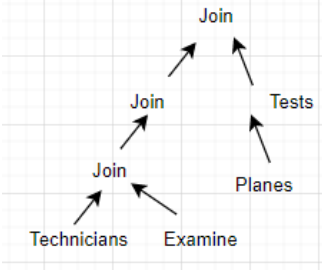
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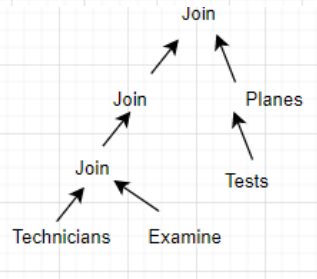
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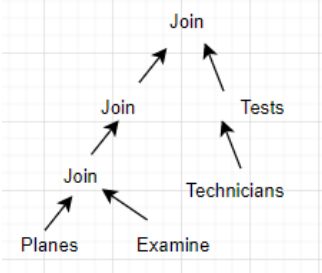
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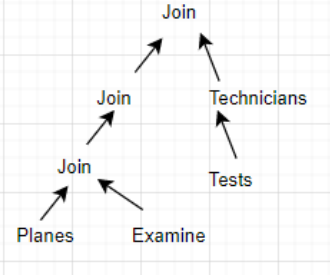
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Submission Instruction

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