

CS5200: Homework 1: Relational Algebra

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1 Questions

1.1 Part 1

1. The model of every PC product whose speed is equal or more than 3.0.

$$2. \pi_{maker} \left(Product \bowtie (\sigma_{ram \geq 2048} (PC)) \right)$$

$$3. \pi_{model} \left(\sigma_{color='false' \text{ AND } type='laser'} (Printer) \right)$$

$$4. \pi_{maker} (Product \bowtie Printer) - \pi_{maker} (Product \bowtie Laptop)$$

$$5. \pi_{model, price} (\sigma_{maker='B'} (Product \bowtie PC))$$

$$6. \pi_{model, price} \left(\sigma_{maker='B'} (Product) \bowtie \left(\pi_{model, price} (PC) \cup \pi_{model, price} (Laptop) \cup \pi_{model, price} (Printer) \right) \right)$$

$$7. maker \gamma_{highestPrice \leftarrow MAX(price)} (Product \bowtie PC)$$

8. All manufacturers (makers) that sell PCs with price less than 750.

maker
A
B
C
D

1.2 Part2

1. schema of the result: (userID : string, firstName : string, lastName : string, numPostsCommented : integer)

2. The expression has type error which is incorrect attribute references in selection, because the result of the sub-expression in parentheses (below) does **not** have the attribute **posted : date**.

$$userID, firstName, lastName \gamma_{numPostsCommented \leftarrow count(postID)} (User \bowtie Comment)$$

For selection operation $\sigma_c(R)$, R must contain attributes in condition c.

The well-typed expression should be:

$$userID, firstName, lastName \gamma_{numPostsCommented \leftarrow count(postID)} \left(User \bowtie \sigma_{year(posted)=2022} (Comment) \right)$$

3. The query (b) is not well-typed.

For semijoin operation $User \ltimes R$,

the result schema is equal to User's schema and relation User does not contain attribute **numPosts**, so the result of the sub-expression in parentheses (below) does not have the attribute **numPosts**.

$$User \ltimes_{userID \gamma_{numPosts \leftarrow count(postID)}} \left(\sigma_{posted \geq '2023-03-01'} (Posts) \right)$$

In addition, for selection operation $\sigma_{numPosts < 5}(R)$, R must contain attribute **numPosts**, therefore there is a type error which is incorrect attribute references in selection.

$$4. userID \gamma_{numPosts \leftarrow COUNT(postID)} (User \bowtie Post)$$