

1DV 013 - Database Theory

Assignment 3 (theory) - Relational Algebra

This assignment contains theoretical questions. The practical part remains the same as for the 2nd assignment. Deadline for both parts is *October 13*.

1 Theoretical Part

1.1 Gallery

Let the following relational schema for administrating exhibitions of pictures be given:

Artist (artistId, name, dateOfBirth, dayOfDeath, homeCountry)
Picture (picId, name, artistId, value)
Museum (museumName, city, country)
Exhibited(picId, museumName, from, to)

The key attributes are underlined. *Exhibited* may contain exhibitions of pictures in the past, present, or future.

Give relational algebra expressions as well as SQL statements for the following queries:

1. Name and date of birth of all living artists who have painted at least one picture of value 50,000 (assume SEK) or more.
2. All museums with name and city in which at least one picture of 'Leonardo Da Vinci' is or was exhibited.
3. The museums (with name and city) which exhibit or did exhibit pictures of **all** the artist who were born in between 1920 and 1950.
4. In *natural* language, describe the result of the following query:

$$\pi_{\text{museumName}, \text{city}, \text{name}}(((\pi_{\text{homeCountry}, \text{artistId}}(\text{Artist}) \bowtie \text{Picture}) \bowtie \text{Museum}_{\text{homeCountry} \leftarrow \text{country}}) \bowtie \text{Exhibited})$$

1.2 Relational Algebra

Given are the following relations:

$R(a, b, c)$
 $S(a, e, f)$
 $T(a, h)$

And, given is now the following relational algebra expression:

$$\pi_{e,h}(\sigma_{b=10}((R \bowtie T) \bowtie S))$$

Which of the following expressions are equivalent to the one above? Give a short explanation to each answer.

1. $\pi_{e,h}((\sigma_{b=10}(R)) \bowtie (\pi_{a,e}(S)) \bowtie T)$
2. $\pi_{e,h}(\sigma_{b=10}(((\pi_b(R)) \bowtie (\pi_{a,e}(S))) \bowtie (\pi_{a,h}(T))))$
3. $\pi_{e,h}((\pi_{a,b}(\sigma_{b=10}(R))) \bowtie (\pi_a(S)) \bowtie T)$