DA 2032 - Database theory

Assignment 3 - Relational Algebra

This third and last assignment contains theoretical questions and a practical part. Deadline for the theoretical part is *October 26*. Please note that you may have to correct issues regarding all your assignment before the oral exams in week 46.

For presentation of the practical part, please schedule a meeting with Antonina Khairova in between *November 02* and *November 04*. Please do this until *October 29*, otherwise you will be assigned a time. If possible, you should bring your own laptop computer for the demonstration. If this is not possible, please notify Antonina about it.

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:
$$\pi_{museumName,city,name}(((\pi_{homeCountry,artistId}(Artist) \bowtie Picture) \bowtie Museum_{homeCountry \leftarrow country}) \bowtie Exhibited)$$

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

2 Practical Part

Write a management tool for your movie database. Valid programming languages are *Java* and *C#*. Your tool should perform the following tasks:

- Management of
  - Movies,
  - Genres,
  - People,
  - and relations among those
- Browsing through and searching for movies and people
- Present a movie or a person:
  - For a movie: length, year, who acted in it, ...
  - For a person: name, what movies did he/she participate in, ...

The tool should make use of the capabilities of the database system, e.g., it should *not* just load all the data into memory and work locally on the data.

A GUI application is preferred (as it is easier to use), but a console based application is valid as well.