Database Management Systems, Aug-Dec 2023

Problem sheet, 1 September 2023

Problem 1 Consider the following relation schema from the university database discussed in the lectures.

`instructor(ID,name,dept_name,salary)`

Write relational algebra queries for the following.

1. Find all faculty members from Physics who earn more than *at least one* faculty member from Comp.Sci.

2. Find all faculty members from Physics who earn more than *every* faculty member from Comp.Sci.

3. Find the faculty member(s) with the minimum salary.

Problem 2 Consider the following relation schema describing a family tree.

`family(ID,name,gender)`
`relation(ID1,ID2,relationship)`

Make the following assumptions:

- In `family`, `gender` takes values `M` or `F`

- In `relation`

    - The Fields `ID1` and `ID2` refer to entries in `ID` from `family`
    - `relationship` takes values `parent` or `spouse`
    - The interpretation of a tuple (`id1,id2,parent`) is that `id1` is the parent of `id2`.

Write relational algebra queries for the following.

1. Compute the relation `sibling(ID1,ID2)` — ID1 is a brother/sister of ID2

   Do this for the following intepretations of sibling.

    - `ID1` and `ID2` have at least one parent in common
    - `ID1` and `ID2` have both parents in common

2. Compute the relation `sister(ID1,ID2)` — ID1 is a sister of ID2 with both intepretations of sister, as above.

3. Compute `grandparent(ID1,ID2)` — ID1 is grandparent of ID2

4. Compute `greatgrandparent(ID1,ID2)` — ID1 is greatgrandparent of ID2

5. Can you compute `ancestor(ID1,ID2)` in general?