COMSW4111_003_2024_3 - INTRODUCTION TO DATABASES

Homework 2A

Submission Instructions

Please see Ed discussions.

Understanding Concepts

1. Briefly explain the concepts of “top-down” and “bottom-up” data modeling.

2. What are two reasons it is necessary to use an *associative entity* to implement a relationship set/relationship between entities.

3. Briefly explain the concepts of the degree of a relationship/relationship set, and the cardinality of a relationship.

4. A theta-join is of the form $r \bowtie_\theta s$, where r and s are relations (tables). What is an equivalent relational algebra statement that only uses π, σ, ×, ∪, -, ρ. Your answer may not need to use all the operators.

5. Consider a domain for an attribute/column in which the possible values are in the range 0.00 to 99.99, and there can only be two digits after the decimal point. What SQL data type would you use?

6. Consider the create table statement below, which columns could be the primary key in a MySQL database and why?

```
create table if not exists course_management.students_fixed
(
  CU_id       int           not null,
  uni         varchar(12)   null,
```

```
  email          text        not null,
  first_name     text        null,
  last_name      text        null,
  middle_name    text        null
);
```

7. Why does using a natural join sometimes produce incorrect results or results that do not make any sense?

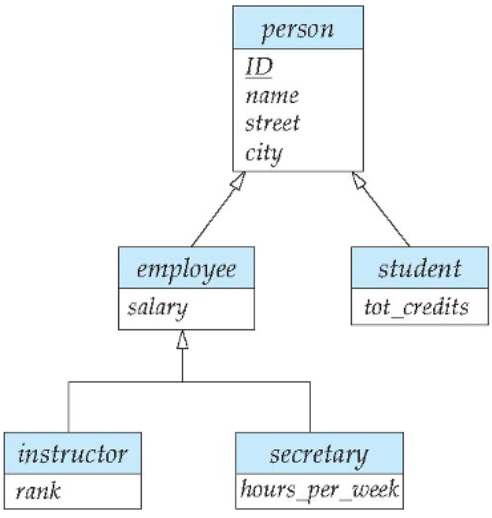
8. Some SQL database management systems do not implement the full outer join operation. Describe how to write an equivalent query to a full outer join using other SQL capabilities.

9. SELECT statements and UNION statements behavior differently with respect to duplicates in a result set. Briefly explain the differences. How can you make SELECT and UNION behave the same with respect to duplicates.

10. Explain the concept of "arity" in SQL statements.

11. Explain the concepts of *overlapping, disjoint, complete and incomplete* when modeling inheritance/specialization in ER-modeling.

12. Consider the diagram from the lectures slides for our course.



Draw the equivalent Crow's Foot Notation diagram. You may have to add/extend

Crow's Foot for your diagram. You can use notes or text to explain your extensions.

13. For the sample data associated with course textbook, the relational expression *course* ▷ *prereq* returns courses without prereqs.
    a. Provide an equivalent query that does not use anti-join.
    b. Provide a query that uses anti-join to return courses that *are not* prereqs.

    You can just provide the statements. You do not need to execute them.

14. In the lecture, we discussed three motivations for using *views*. List and briefly explain the motivations/use cases.

15. What is a *materialized view?* What is one advantage, and one disadvantage of a materialized view compared to a non-materialized view.