Helsinki university, Department of Computer Science
Introduction to Databases, 17.4.2001, H.Laine

Write your name, date of birth (personal number if you have not registered), name and date of the course and your signature on each answer paper.

1. Let's consider the relations A($\underline{a}$,b,c,d,e), cardinality (number of tuples) n>0 tuples, and
   B($\underline{a \rightarrow A,f}$,e,d,g), cardinality m>0 tuples. Notations: π projection, $\times$ Cartesian product, $|\times|$ join, *
   natural join, σ selection.
   a) List the columns of A * B .
      a,b,c,d,e,f,g

   b) What is the join condition in A * B.
      A.a=B.a and A.d=B.d and A.e=B.e

   c) What is the cardinality (number of tuples) of A $|\times|$ $_{A.a=B.a}$ B ?
      m

   d) Compare the cardinalities of π_a(A) and π_a(B) ?
      cardinality(π_a(A))>= cardinality(π_a(B))

   e) In the operation **A $\cup$ B** allowed and if it is what are the prerequisites ?
      This is allowed id the domains for each of the attributs pairs (A.a,B.a), (A.b,B.f), (A.c,B.e), (A.d,B.d) and (A.e,B.g) match..

   f) Can there be null values in column f of relation B? (6 p)
      No because f belong to key

Lets considet the following tables dealing with thesis administrarion

```
student(identifier, name, address, speciality)
thesis(number, title, date_specified, prepared_by ->instructor,
    reserved_for ->student, date_reserved, date_started, date_finished,
    state, gredit, description)
    State: under_preparation, started, finished
instructor(name, degree)
    Name in form last name space first name
instruction (work->thesis, instructor->instructor, first_date, last_date, role)
    Role: 1 = primary instructor, 2 = assisting instructor
evaluation(work->thesis, phase, date_submitted, date_evaluated, statement)
    Phase: plan, final
evaluator((work,phase,date_submitted)->evaluation, inspector->instructor).
```

2. Express the following queries in SQL. Determine the proper order for the results.
   a) Titles, and student's names and dates started for theses started in year 2001..
```
select name, title, date_started
from thesis, student
where thesis.reserved_for= student.identifier and
      date_started >='1.1.2001'
order by name;
```

   b) Titles and the role of instructor for theses instructed by Timo Alanko and not finished yet, primary instructions first.

```
select title, role
from thesis, instruction
where instructor= 'Timo Alanko' and
   sysdate between instruction.first_date and
      instruction.last_date and
   instruction.work=thesis.number and
   date_finished is null
order by title;
```

c) Theses (title, name of student) that have been started but have not been assigned instructors.

```
select name, title
from thesis, student
where thesis.reserved_for= student.identifier and
   date_started is not null and
   thesis.number not in
      (select work from instruction)
order by name;
```

d) The average duration (days) of thesis writing for theses finished in year 2000.

```
select avg(date_finished - date_started)
from thesis
where date_finished between '1.1.2000' and '31.12.2000';
```

e) The yearly amounts of finished theses per grades. The function yearOf(Date) is assumed to give the year of the parameter Date.

```
select yearOf(date_finished) year, grade, count(*)
from thesis
where state='finished'
group by year,grade;
```

f) Top evaluators in year 2000, i.e. a list of instructors and their number of evaluations in year 2000, the one with most evaluations first. (12p)
```
select inspector, phase, count(*)
from evaluator
where date_submitted between '1.1.2000' and '31.12.2000'
group by inspector, phase
order by phase, count(*) desc;
```

2. The instructors of the thesis are usually assigned as its evaluators. Let's assume that this is also true for the final evaluation of the thesis whose title is 'MYCT-architecture'. Give the operations for registering the submission of this thesis for its final evaluation and assigning the evaluators. You may assume that the title uniquely identifies the thesis. (4p)

```
insert into evaluation
   select identifier, 'final', sysdate, null, null)
   from thesis where name='MYCT-architecture';

insert into evaluator
   select identifier, 'final', sysdate, instructor
```

```
        from thesis, instruction
        where sysdate >= instruction.first_date and
          (instruction.last_date is null or
           sysdate<=instruction.last_date) and
          instruction.work=thesis.number and
          name='MYCT-architecture';

    commit;
```

4. Explain the role and use of the Java class ResultSet in a JDBC database query. (3p)

5. You may substitute the exercise points (early Spring) by taking the following task. *If you want to include the exercise points just reply: "EXERCISE POINTS". A list of exercise points achieved will be available in the exam.*

   Explain briefly the components of a database management system (5p)