University of Helsinki, Department of Computer Science
Basics of Databases, 17.4.2000, H.Laine

Write your name, date of birth (if you have not registered your social security number), the name of the course, date of the exam and your signature on each answer sheet

1. Let's consider the relations A (n>0 tuples) and B (m>0 tuples). a, b, k and v denote columns. Notations: π projection, $\times$ cross product, $|\times|$ join, σ selection. Which of the following claims are true.

   a) The cardinality (number of tuples) of relation $\pi_a(A)$ may be less than the cardinality of relation $\pi_{a,b}(A)$.

   b) Relation $A \cup B$ has at least as many tuples as relation $A \times B$.

   c) Relation $A |\times|_{a=b} B$ always has fewer tuples than relation $A \times B$.

   d) Let k be the key of relation A and v a foreign key that refers to A. The cardinality of $A |\times|_{k = v} B$ is equal to the cardinality of B.

   e) Let k be the key of relation A and v a foreign key that refers to A The cardinality of $A |\times|_{k \neq v} B$ is zero (0).

   f) Let k be the key of A. If relation $\sigma_{k = 's'}(A)$ is not empty and $\pi_a(A)$ has one tuple then relation A has only one tuple.

Consider the following stock exchange tables

```
person(pId, name, address)
company(cId, name, address, shares)
share_holder(owner→person, ltd → company, shares, date_updated)
insider(ltd→company, who→person, begin_date, end_date)
bidToSell(bidder→person, ltd→company, dateOfBid, timeOfBid, shares, price)
bidToBuy(bidder→person, ltd→company, dateOfBid, timeOfBid, shares, price)
deal(dealId, buyer→person, seller→person, subject→company, shares, price,
     dateOfDeal, timeOfDeal)
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All prices are unit prices. Function *sysdate* gives the current date. Share_holder contains the state of ownership at the time specified in date_updated.

2. Express the following queries in SQL. Specify the proper order for the resulting rows.
   a) Bids made today to buy shares of Nokia.
   b) Are there any companies an insider of which has made single deals of more than 1000 shares today? Who is this insider and what kind of deals has he/she made?.
   c) Companies, the shares of which nobody has bidd to buy today. (12p)

3. Express the following queries in SQL. Specify the proper order for the resulting rows.
   a) the number of insiders in Nokia company.
   b) Companies, whose shares are dealt for more than 10 million marks today.
   c) Companies, whose average stock rate (average over deals made) has gone down today (you may assume that stocks were exchanged yesterday). (12p)

4. The state of holding shares is updated in the process of declaring the deals. Outline how the declaration software should process the database. Explain the procedure and what database operations are needed.. You need not give the operations exactly in SQL, but explain what they should do. You need not explain any technical detail of, for example, JDBC or things like that. (12p)

5. Explain briefly what views are and what they are used for. (12p)