Uppsala universitet
Institutionen för informationsteknologi
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Tentamen 2004-04-14
DATABASTEKNIK - 1DL116, 1MB025

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Datum .....................................Onsdagen den 14 April, 2004
Tid ...........................................................8:00-13:00
Jourhavande lärare ...Kjell Orsborn, tel. 471 11 54 eller 070 425 06 91

Hjälpmedel ..............................................miniräknare
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Anvisningar:

- Läs igenom hela skrivningen och notera eventuella oklarheter innan du börjar lösa uppgifterna. Förutom anvisningarna på skrivningsomslaget så gäller följande:
  - Skriv tydligt och klart. Lösningar som inte går att läsa kan naturligtvis inte ge några poäng och oklara formuleringar kan dessutom misstolkas.
  - Antaganden utöver de som står i uppgiften måste anges. Gjorda antaganden får förstås inte förändra den givna uppgiften.
  - Skriv endast på en sida av papperet och använd ett nytt papper för varje uppgift för att underlätta rättning och minska risken för missförstånd.
- För godkänt krävs det cirka 50% av maxpoäng.

1. **Database terminology:** 2pts

   Concisely explain the following concepts (in a database context):

   (a) primary key

   (b) Third normal form (3NF)

2. **Data models:** 4pts

   Explain, and give examples of, what is meant by the two concepts *physical* and *logical data independence* that can be accomplished through the three-schema architecture.

3. **Relational model - integrity constraints:** 4pts

   Explain in the context of the relational model the following concepts:

   (a) entity integrity

   (b) referential integrity

4. **SQL:** 2pts

   Express the following query in SQL and in two variants, with and without using a nested subquery, with the help of the relational schema below:

   ```
   Find the names of all warehouses that have greater storage
   areas than some warehouse located in Uppsala.

   WAREHOUSE(WHOUSE-NAME,CITY,AREA)
   ```

5. **Transactions:** 4pts

   Describe the properties that one would like transactions to fulfill in a database context (hint: ACID).

6. **Security and Authorization:** 4pts

   (a) How is authorization specified in modern relational databases?

   (b) Why are views useful for authorization?

   (c) When can a user transfer authorization rights to another user?

   (d) What is 'access matrix'?

7. **Object-Oriented and Object-Relational Databases:** 4pts

(a) What are the three most important kinds of user-definable database extensibility mechanisms available in an object-relational database system? (3 p)

(b) Which one of the above extensibility mechanisms is lacking in an object-oriented kind of database system (an 'object store')? (1 p)

8. **Active Databases:** 4pts

(a) What are the kinds of problems where ECA rules should *not* be used? Motivate why not. (2p)

(b) Give an example of a problem where ECA rules should be used. Motivate why. (2p)

9. **Query Processing:** 4pts

We have a table

```
PERSONS(SSN, NAME)
```

SSN is key and the table is clustered on SSN. There is a B-tree index on NAME. Given the query

```
select SSN from PERSON where NAME = "KALLE"
```

(a) What two execution plans are possible? (1 p)

(b) Give exact formula stating which plan is faster in terms of parameters of the physical representation of the table in the database. When are they equally fast? (3p)

Good luck!

/ Kjell och Tore