

# Tentamen 2006-04-19

## DATABASE TECHNOLOGY - 1MB025

Date ..... Wednesday 19 April, 2006  
Time ..... 09:00-14:00  
Teacher on duty ..... Kjell Orsborn, phone 471 11 54 or 070 425 06 91  
Exam aids ..... calculator

### Instructions:

- Read through the complete exam and note any unclear directives before you start solving the questions. The following guide lines hold:
  - Write clear and neat answers! Answers that cannot be read can obviously not result in any points and unclear formulations can be misunderstood.
  - Assumptions outside of what is stated in the question must be explained. Any assumptions made should not alter the given question.
  - Write your answer on only one side of the paper and use a new paper for each new question to simplify the correction process and to avoid possible misunderstandings.
- A passing grade requires about 50% of the maximum number of points.

1. **Database terminology:** 4 pts

Explain the following database concepts:

- (a) relational schema (sv. relationsschema)
- (b) secondary index (sv. sekundärindex)
- (c) deadlock (sv. "dödlig låsning")
- (d) BCNF

2. **Data models:** 4 pts

Explain the concepts primary key (sv. primärnyckel) of the relational data model and object identifier (sv. objektidentifierare) of an object data model and their most important properties.

3. **Conceptual modeling:** 4 pts

In enhanced entity-relationship modeling (sv. utökad entitets-relations-modellering) one can specify certain constraints for a specialization and generalization (sv. specialisering och generalisering). Explain in this context the following concepts:

- (a) disjointness constraint
- (b) completeness constraint

4. **Transactions:** 4 pts

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

5. **Physical database design:** 4 pts

Explain the organization and functionality of hash-files (the answer should include how to retrieve a data record with regard to a specific search key of the hash-file).

6. **Object-oriented and object-relational databases:** 4 pts

- (a) Describe the three main kinds of user-definable database extensibility mechanisms available in an *object-relational* database system (sv. 'objektrelational databas')? (3pts)
- (b) What is swizzling and what is it used for? (1pt)

**7. Query optimization:**

4 pts

- (a) What is *selectivity* (sv. 'selektivitet') and how is it used in a cost-based query optimizer? (1pt)
- (b) What is the worst case complexity of cost-based query optimization? (1pt)
- (c) Why does cost-based query optimization pay off despite its complexity? (1pt)
- (d) How are operators in execution plans different from relational algebra operators? Give examples. (1pt)

**8. Database APIs:**

4 pts

- (a) What is JDBC? (1 pt)
- (b) How does JDBC handle the high cost of dynamic query optimization? (1 pt)
- (c) What does 'O' in 'ODBC' stand for? (1 pt)
- (d) How does JDBC handle queries that return very large result sets? (1 pt)

Good luck!

/ Kjell och Tore