

**Comprehensive Exam**  
**Databases**  
**Spring 2005**

1) (30 points) A crucial step during the database design process is to *decompose* a table into a collection of tables that in some sense are “better” than the original table. For example, the following table:

loan-info = (loan#, borrower-name, branch-name, amount)

Could be decomposed into the following tables:

borrower = (borrower-name, loan#)

loan = (loan#, branch-name, amount)

(a) List three things that one normally strives to achieve when decomposing tables during the database design process.

(b) In general, does decomposing a table in the above manner improve query performance or degrade query performance? Be sure to explain your answer.

(c) Are there any circumstances under which one would not decompose the loan-info table into borrower and loan as shown above (yes or no)? Be sure to explain your answer.

2) (30 points) During system development a choice frequently must be made to use either a commercial (COTS) DBMS, or to develop from scratch the software that maintains and processes the stored data (i.e., a custom developed file-processing system).

(a) Describe a circumstance where developing a custom file-processing system would be preferable. Be sure to explain why the custom system would be preferable in this case.

(b) Describe a circumstance where a COTS DBMS would be preferable. Be sure to explain why the COTS DBMS would be preferable in this case.

(c) Suppose you were a software consultant, and that you were going to develop a questionnaire for potential customers that would help you determine whether a COTS DBMS or file-processing system should be used on a system they were developing. List 3 questions you would ask on your questionnaire.

3) (30 points)

(a) Define what is meant by a non-procedural query language?

(b) Define what is meant by a procedural query language?

(c) Is tuple-calculus procedural or non-procedural? Be sure to explain your answer.

(d) Is relational algebra procedural or non-procedural? Be sure to explain your answer.

(e) Is SQL procedural or non-procedural? Be sure to explain your answer.

4) (10 points) List and define the three different levels of data abstraction in a database system.