CS 348 – Information Systems
Midterm Exam Study Guide
Dr. James P. Early
Spring 2006

Material

I. Chapter 1 - Introduction
   A. Types and uses of database systems
   B. How is data organized into levels?
      i. Physical
      ii. Logical
      iii. View
   C. What is the difference between instances and schemas?
   D. What are the types of languages found in a database system?
      i. Data manipulation language
      ii. Data definition language
   E. What are the characteristics of relational databases?
   F. What types of users can be found in a database system?

II. Chapter 2 - Relational Model
   A. What is the structure of relational databases?
      i. Rows (tuples), columns (attributes), domains, schemas
      ii. What are the rules concerning keys
         a) Primary
         b) Foreign
      iii. Query languages
         a) procedural versus non-procedural
   B. What are the rules and assumptions associated with these relational algebra operations?
      i. Select
      ii. Project (both regular and generalized)
      iii. Union
      iv. Set difference
      v. Cartesian product
      vi. Rename
      vii. Set intersection
      viii. Natural (inner) join
      ix. Division
      x. Aggregate
      xi. Outer join
         a) The difference between right and left
   C. What are the properties of null values in logic and relational algebra operations?

D. Database modification
   i. Deletion
   ii. Insertion
   iii. Updating

III. Chapter 3 – SQL
   A. How is data defined?
      i. Domain types
      ii. Table schemas
   B. How are basic SQL queries structured?
      i. What are the purposes of the '*select'*, '*from'*, and '*where'* clauses?
      ii. Rename operation
      iii. Tuple variables (for SQL, not for tuple relational calculus)
      iv. String (pattern) matching
      v. Duplicates
      vi. Tuple ordering
   C. What rules must apply when using these SQL set operations?
      i. Union
      ii. Intersection
      iii. Except
   D. Aggregate functions
      i. What are the different types?
      ii. How are the '*group by'* and '*having'* clauses used?
   E. How are null values handled in SQL statements?
   F. What are the uses of nested subqueries?
      i. Set membership and comparison
      ii. Testing for empty relations and the absence of duplicate tuples
   G. Creating views
      i. Use of the *'with'* clause
      ii. Persistent views
   H. Database modification
   I. Performing '*join'* operations

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IV. Chapter 4 – Advanced SQL
- A. Special data types
  - i. date / time / timestamp
  - ii. User-defined
  - iii. clob / blob
- B. Integrity constraints
  - i. not null / unique
  - ii. The 'check' clause
    - a) What are some implications of its use?
  - iii. What is referential integrity?
  - iv. What are assertions, and what are the implications of their use?
- C. How are users authorized to read or update the contents of the database?
- D. What is the difference between embedded and dynamic SQL?
- E. What steps are typically used by an external program to extract data from a database?
- F. What are the differences between SQL functions and procedures?
  - i. How are the parameters defined for each?
- G. Recursive queries
  - i. How are these constructed?
  - ii. What must all such queries have?
  - iii. How do we know when the recursion stops?

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V. Chapter 5 – Other Relational Languages
  A. Tuple Relational Calculus (TRC)
    i. What do variables stand for?
    ii. How do we extract desired attributes?
  B. Domain Relational Calculus (DRC)
    i. What do the variables stand for?
    ii. How do we indicate a *'join'* operation?
  C. Query by example (QBE)
    i. How do we indicate a particular attribute value should be displayed?
    ii. In what ways is the negation operator used?
    iii. Queries involving more than one relation

Format

The midterm exam will be a mixture of any or all of the following types of questions:

- True/false
- Multiple choice
- Fill in the blank
- Short answer (1-2 lines of text)
- Using relational algebra, SQL, tuple relational, domain relational, and QBE queries
  - Generation
  - Interpretation
  - Conversion between different query types

The exam will be closed book and closed notes. The grade for this exam represents approximately 20% of the course grade.