Midterm Exam Study Guide CSC 321/621 – Spring 2012

Course objectives:
At this point, students should be able to:

Data Modeling

- Describe the modeling concepts and notation of and the fundamental terminology used in the entity-relationship model
- Describe the basic principles and illustrate the modeling concepts and notation of the relational data model.

Relational Databases

- Prepare a relational schema from a conceptual model developed using the entity-relationship model
- Explain and demonstrate the concepts of entity integrity constraint and referential integrity constraint (including definition of the concept of a foreign key).
- Demonstrate use of the relational algebra operations from mathematical set theory (union, intersection, difference, and cartesian product) and the relational algebra operations developed specifically for relational databases (select (restrict), project, join, and division).
- Demonstrate queries in the relational algebra..
- Demonstrate queries in the tuple relational calculus

Query Languages

- Create a relational database schema in SQL that incorporates key, entity integrity, and referential integrity constraints.
- Demonstrate data definition in SQL and retrieving information from a database using the SQL SELECT statement.

Relational Database Design

- Determine the functional dependency between two or more attributes that are a subset of a relation.
- Determine whether or not a set of attributes form a superkey and/or candidate key for a relation with given functional dependencies
- Describe what is meant by and identify whether a relation is in 1NF, 2NF, 3NF, and BCNF.
- Normalize a 1NF relation into a set of 3NF (or BCNF) relations

*** Graduate students will have one or more additional questions ***
(in the same amount of time)

Things you will NOT have to do/know:

- Do not memorize the relational algebra symbols. I will provide a key for those.
- Semantic nets will not be on the test.
- Relational calculus will not be on the test
- Don't worry too much about the set of slides on "ternary vs. multiple binary" relationships.
- Don't be overly concerned with the slides on "problems with NULLs in a relation", though make sure you understand what a NULL entry is and means
- Don't worry about the division relational operator.
- Don't worry about the SQL for INTERSECTION, UNION, and DIVISION, nor the MYQSL workarounds, nor the SQL for INSERT, UPDATE, or DELETE.

Key areas to focus on (likely WILL be on the test):

- There will not be extensive SQL on the test, but there will be some – you should be generally familiar with it (the queries and statements won't be overly complicated). They could be either DDL (CREATE) or DML (SELECT) statements. Be able to read/interpret SQL statements as well as be able to write SQL statements.
    - You should understand what "aggregate" functions (COUNT, MAX, MIN, …) exist, and the use of/utility of SORT BY AND GROUP BY.
    - The ins/and outs of the SQL terms IN, ANY, ALL, and HAVING won't be that important for the test (interpretation only)
- Being able to understand and develop E/R diagrams and be able to converse in the language of E/R diagrams (entities, attributes, multiplicity, etc.).
- Be able to work with relations in their tabular sense (our primary use of them), but make sure you also understand how they are also mathematical objects (sets of tuples) which we can apply operators to
- Converting from an E/R diagram to a relational model (there are several rules that are useful to know) is a fundamental skill
- Familiarity with the notion of foreign keys and integrity (entity and referential) constraints
- Significant understanding of the primary relational operators is important. Focus on selection, projection, cartesian product, the various types of joins, and why they are useful; put less focus on union, intersection, and difference.
- Be able to interpret relational algebra expressions as well as write relational algebra expressions.
- Understanding of update (insertion/deletion/modification) anomalies could show up on the test, either in a definition or "give-me-an-example sense".
- Understanding of what functional dependencies are and how functional dependencies relate to primary/candidate keys is important. You should be able to enumerate a list of functional dependencies for a given relation.
- Understanding of what it means for a relation to be in 1NF, 2NF, 3NF, and BCNF. You may be asked to say whether or not a given relation is in a given normalized form, and/or you may be asked to put a given relation in a given normal form via decomposition.