CS450 Fall 2023 Final Exam Review

Time: 7:30-9:30 AM on Dec. 6th, 2023
Location: ENT 80

The exam is closed-book and closed-notes. You can prepare a one-page cheat sheet on letter-size paper, and double sided is fine.

Types of questions you might have in the final exam:

Multiple choice
True/False
Matching
Problem solving

Be familiar with the slides from lecture 12 to lecture 18
Topics might be covered:

Database Programming
1. Distinguish between statement-level interface and call-level interface
2. Basics of embedded SQL
3. Distinguish between embedded SQL and dynamic SQL
4. Basics of JDBC
5. Distinguish between SQLJ and JDBC

Functional Dependencies
1. Evils of redundancy: insert/delete/update anomalies
2. What are functional dependencies?
3. Relationship between FDs and schema, relationship between FDs and keys
4. Understand inference rules: Armstrong's Axioms
5. How to calculate attribute closure and its usage
6. How to tell if one FD follows from others?

Normalization:
1. What is normalization?
2. Understand 1NF, 2NF, 3NF, BCNF, identify violations of 1NF, 2NF, 3NF, BCNF, how to normalize into 1NF, 2NF, 3NF, BCNF?
3. Distinguish between prime and nonprime attributes
4. Distinguish between full and partial functional dependency

Properties of Decompositions:
1. Understand lossless join decomposition
2. Testing binary decomposition for lossless join
3. Basics of dependency preserving decomposition
4. Understand minimal cover
5. How to find a minimal cover?

Decompositions:
1. Lossless join decomposition into BCNF
2. Understand 3NF synthesis
3. Dependency preserving and lossless join decomposition into 3NF
4. How to find a key?
5. Summary of decompositions

NoSQL
1. Issues with relational database: impedance mismatch problem, scale up or out
2. Features and characteristics of NoSQL database, CAP theorem, BASE
3. Basics and characteristics for each type of NoSQL database and their suitable use cases
4. SQL vs. NoSQL summary
5. Basics of MongoDB, document embedding vs. document linking, basic MongoDB queries (insertOne(), insertMany() (ordered or unordered), find(), etc.)

Practice questions:

1. Select the scenario where the ACID properties can't be relaxed.
   (a) Amazon shopping cart
   (b) Facebook posts
   (c) Tweets
   (d) Money in bank

2. True or False:
   ___Statement-level interface needs a pre-compiler.

3. Consider the relation R={A, B, C, D, E, F, G, H, I, J} and the set of functional dependencies F={AB→C, A→DE, B→F, F→GH, D→IJ}
   a) What is the key for R?
   b) Decompose R into 2NF relations.
   c) Using 3NF synthesis, find a dependency preserving and lossless join decomposition of R into 3NF relations.