Midterm Review

- SQL Queries - Chapter 4/5
- Relational Algebra - Chapter 6
- ER Diagrams – Chapter 7
- ER to Relational Schema – Chapter 9
- Normalization – Chapter 15
- Functional Dependencies – Chapter 16
SQL Queries – Chapters 4-6

- Options for update and delete on a foreign key
- What does domain refer to?
- What is a view? How does it differ from a table?
- Common SQL Queries
- Common relational algebra
Chapter 7 & 9

- Provide an ER Model based on requirements
- Provide a table design based on ER Model
  - 1 to 1
  - 1 to M
  - M to N
Chapter 15

- Measures for quality of relational design
  - Clear semantics of attributes
  - Redundant information and update anomalies
  - NULL values
  - Generation of spurious tuples
Chapter 15

- Normalization
  - Superkey, candidate keys, primary key, secondary key
  - Prime attribute, non-prime attribute
  - First normal forms
  - Second normal forms and partial dependencies
  - Third normal forms and transitive dependencies
  - Boyce-Codd normal forms
  - Difference in general/strict definition of normal forms
Chapter 16

- Functional dependencies
  - Inference rules
  - Closure of attributes under functional dependencies
  - Cover of functional dependencies
Consider the following set of requirements for a library database that is used to keep track of books, CD’s, and DVD’s. They are considered collectively as assets, and each asset is assigned a unique asset id.

Besides the asset id, the library tracks the title, publisher, and year of publication for each asset. Additional information is also recorded, which includes the authors and number of pages of a book, and the artists of a CD.

An asset can have multiple copies that share the same asset id. A patron can only borrow copies.

The library keeps track of each patron’s name, library id, current address and phone, and the copies of assets that they have borrowed.

For each transaction, the library records the date on which an asset was borrowed and the date when it becomes overdue. In addition, a patron cannot borrow more than one copy of the same asset. Past transactions are NOT maintained.

The library also keeps track of the location for books, CD’s, and DVD’s that are in the library. Each location has a location id.
15.27 – Consider a relation \( R(A,B,C,D,E) \) with the following dependencies:

- \( AB \rightarrow C \)
- \( CD \rightarrow E \)
- \( DE \rightarrow B \)

Is \( AB \) a candidate key of this relation? If not, is \( ABD \)? Explain your answer.
2NF/3NF (Preserving Dependencies)

- \( R = \{A, B, C, D, E, F, G, H, I, J\} \)
- \( F = \{ \{A, B\} \rightarrow \{C\}, \{A\} \rightarrow \{D, E\}, \{B\} \rightarrow \{F\}, \{F\} \rightarrow \{G, H\}, \{D\} \rightarrow \{I, J\} \} \)
- Naïve 2NF versus closure/preserving dependencies
2NF/3NF (Preserving Dependencies)

- $R = \{A, B, C, D, E, F, G, H, I, J\}$
- $G = \{\{A, B\} \rightarrow \{C\}, \{B, D\} \rightarrow \{E, F\}, \{A, D\} \rightarrow \{G, H\}, \{A\} \rightarrow \{I\}, \{H\} \rightarrow \{J\}\}$. 
- Naïve 2NF/3NF versus closure/preserving dependencies