CMPE 138/180-38 REVIEW

MIDTERM EXAM

- Database approach
  - characteristics
  - advantages
- Data model
  - why
  - what
- Database design or data model steps
- Data independence
  - logical
  - physical
- ER diagram
  - notations
  - Entity, weak entity
  - Attribute
    - Composite
    - Derived
    - Single-values/Multi-values
  - Key, partial key
  - Relationship, identifying relationship
    - 1:1, 1:N, M:N
    - Recursive relationship
    - binary relationship, ternary relationship, etc.
  - Structural constraints
    - Cardinality ratio
    - (min, max)
    - Participation
  - UML
  - Relationship vs. operation
- Enhanced ER Diagram
  - Inheritance, superclass, subclass
  - Specialization
    - why
    - benefits
    - completeness: total/partial
    - disjointness/overlapping
  - Generalization
  - Specialization lattice
    - Single/multiple inheritance
  - Union or category
    - Vs. shared subclass

- Relational model
    - Domain
    - Attribute
    - Tuple
    - Relation
    - NULL
    - Constraints
        - Domain
        - Key: superkey, key, candidate key, primary key
        - Integrity
            - Entity IC: PK cannot be NULL
            - Referential IC
                - Foreign key
                    - ON UPDATE CASCADE…
                    - ON UPDATE CASCADE …
        - Insert/update/delete vs. various constraints
    - OLTP vs OLAP
- SQL queries
    - Schema
    - Catalog
    - DDL: create, alter, drop
    - Table
        - Column
            - Data type
            - Nullability
            - Default
            - Check
        - Primary key
        - Foreign key
            - ON UPDATE CASCADE…
            - ON DELETE CASCADE…
        - Unique
    - SELECT
        - DISTINCT
        - SELECT … FROM … WHERE … GROUP BY … HAVING … ORDER BY …
        - JOIN: inner join, left/right/full outer join
        - UNION, INTERSECT, EXCEPT
        - LIKE, wild card characters _ and %
        - BETWEEN
        - IN
        - EXISTS
        - =
    - INSERT/UPDATE/DELETE

    - NULL
        - IS NULL, IS NOT NULL
        - Three-value logic
    - Nested query
        - Correlated nested query
    - Aggregation function
        - COUNT, MAX, MIN, SUM, AVG
        - include/exclude NULL
    - Trigger
    - View
        - vs. base table
- SQL query exercises
    - db/textbook-company
    - db/addl-company
    - 07sql_exercises

FINAL EXAM (also review MIDTERM EXAM section + SQL queries)

- Relational Algebra
    - Relational algebra vs. relational calculus
    - Relational algebra operators
        - SELECT
        - PROJECT
        - JOIN, NATURE JOIN, EQUIJOIN, OUTER JOIN
        - UNION
        - INTERSECTION
        - DIFFERENCE
        - CARTESIAN PRODUCT
        - DIVISION
        - aggregation function, grouping
    - SQL query <-> Relational algebra
- ER-to-Relational Mapping
    - Regular Entity Types
    - Weak Entity Types
    - Binary 1:1 Relationship Types
    - Binary 1:N Relationship Types
    - Binary M:N Relationship Types
    - Multivalued Attributes
    - N-ary Relationship Types
    - Specialization or Generalization
    - Multilevel Specialization Hierarchy or Lattice
    - Union Types (Categories)
- Functional Dependencies and Normalization

    - Informal Design Guidelines
    - Functional Dependencies (FD)
    - Inference Rules for FD
    - Goals of normalization
        - Remove duplication
        - Minimize redundancy
        - Minimize update anomalies
    - Decomposition
        - Nonadditive join or lossless join property: must
        - Dependency preservation property: desirable
    - Superkey vs key vs candidate key vs primary key
    - Normalization test for each normal form
    - PK-based normalization
        - 1NF
        - 2NF
        - 3NF
    - General definition
        - 2NF
        - 3NF
        - BCNF
    - 4NF
    - 5NF
- Transaction
    - Why concurrency control
    - Transaction definition
    - Transaction state
    - Transaction log
    - Recovery
    - ACID
    - Schedule
    - Conflict operation
    - Based on recovery
        - Recoverable
        - Cascadeless
        - Strict
    - Serial schedule vs serializable schedule
    - Seriaizable schedule
        - Conflict equivalent
            - Test: precedence graph
        - View equivalent
    - Transaction isolation level
- Concurrency Control
    - why

- Binary lock
- Read/write lock
- Two-phase lock (2PL)
  - Serializable
- Deadlock
  - Definition
  - Prevention
  - detection
- Starvation
- Timestamp Ordering
- Pros and cons for each mechanism