Fall 2019

Exam Preparation

Both topics covered in the readings in the textbook and in class are included, but with an emphasis on the class lectures. All topics from test 1 and test 2 are also inluded. The topics covered in the lectures (lecture slides) are all included. Some of the relevant readings covered are indicated in the topic list below.

I. Basics and Overview [Ch 1]
- evolution of database systems
- what functions database systems provide

II. Data Models (& Schemas) [Ch 2: §1–3]

A. overview of data models
   1. 1.what is a data model?
   2. 2.the relational model, in brief

B. the relational model
   1. 1.basics
   2. 2.data independence

C. defining relational schema in SQL

III. conceptual modelling [Ch 4: §1–6 & Ch 7: §1.1 & 1.2]

entity/relationship model
   1. entity sets, relationship sets, & attributes
   2. multiway relationsips
   3. multiplicity in relationships
   4. "recursive" relationships and roles
   5. subclasses ("isa")

A. design principles
   1. fidelity / faithfulness
   2. brevity: avoiding redundancy
   3. simplicity
   4. naturalness

B. constraints in the E/R model
   - keys!
   - referential integrity

C. weak entity sets

D. from E/R diagrams to relational designs

E. converting subclass structures to relations
   - from entity sets to relations (tables)
   - from E/R relationships to relations
   - combining relations
   - handling weak entity sets
   - using foreign key contraints to enforce referential integrity [Ch 7: §1.1 & 1.2]

IV. design theory [Ch 3]

keys & functional dependencies [Ch 3: §1, §2, §3.1, & §3.3]
   - keys, superkeys, & functional dependencies [Ch 3: §1-5]

- reasoning about FDs

A. the normal forms [design theory slidedeck]
   - anomalies
   - what each normal form protects against
   - how to test a relation for a normal form

B. decomposition [Ch 3: §3.2, §3.4 & §4]

V. **Queries**

A. conceptual query languages (relational algebra) [Ch5]

B. SQL [Ch 6]

1. SQL: queries [Ch 6: §1-3 & 4,5]
   a) the basics
      i. select-from-where
      ii. multi-relation queries
      iii. Sub-queries
   b) Advanced
      i. Aggregation
      ii. insert / delete / update
      iii. join
2. constraints & triggers [Ch7]
3. Transaction [Ch 6: §6]
4. authetication

VI. Application

the system, *transaction management*, *concurrency control*, *crash recovery*,

1. database system overview
2. transaction management (& concurrency control) [Ch 18]
   - introduction: transaction management & ACID
   - transactions, views, & indexes (Book) [Ch 6: §6 & Ch 8]
3. Concurrency Control [Ch 18]
   - Serial and Serializable Schedule [Ch 18: §1]
   - Conflict-Serializability [Ch 18: §2.1]
   - Enforcing Serializability by Locks [Ch 18: §3]
   - Locking Systems With Several Lock Mode [Ch 18: §4]
4. crash recovery