Midterm Review: Fall 2016

CS-6360 Database Design

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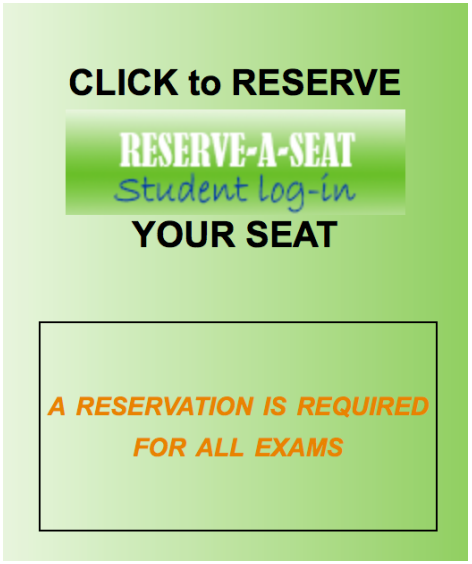
Midterm Parameters

- Closed Book, Closed Notes
  - Accessing eLearning course materials (lecture slides, notes, etc.) during an exam is **absolutely prohibited**
  - **Location**: Testing Center
  - **Time**: About regular lecture time
    - Reserve-A-Seat exact time per student
    - Arive early
  - **Duration**: 90 minutes
    - Regardless of start time

Testing Logistics

- UTD Testing Center (*not classroom*)
  - McDermott Library Basement
- Reserve a seat in advance!
  - http://www.utdallas.edu/studentsuccess/testingcenter/



Testing Center

- **Testing Center**
  - Identification: Comet Card
  - Bathroom breaks are prohibited (please plan ahead)
  - No jackets or sweaters
  - No backpacks
  - No pencil boxes
  - Non-approved calculators prohibited
    (calculator supplied, if needed)
  - Scratch paper and whiteboard supplied, if needed.

Content Summary

- Review the textbook!!
  - These slides are an *outline*, not a comprehensive content
- Introduction (1,2)
- ER / EER model (3,4)
- Relational Model (5)
- SQL (6, 7)
- File Structures and Hashes (16)
- Indexes (17)
- Review homework
- Review end of chapter exercises and questions

Ch. 1: Databases and Database Users

UTD

- **Bold** concepts and definitions
  - §1.3 Characteristics of the Database Approach
  - §1.4 Actors on the Scene
  - §1.5 Workers behind the Scene
  - §1.6 Advantages of Using the DBMS Approach
- T/F, Multiple Choice, Multiple Answer, Matching
- No verbatim memorized definitions

Ch. 2: Database System Concepts and Architecture

UTD

- **Bold** concepts and definitions
  - §2.1 Data Models, Schemas, and Instances
  - §2.2 Three-Schema Architecture and Data Independence
  - §2.3 Database Languages and Interfaces
  - §2.4 The Database System Environment
  - §2.5 Centralized and Client/Server Architectures for DBMSs
  - §2.6 Classification of Database Management Systems
- T/F, Multiple Choice, Multiple Answer, Matching
- No verbatim memorized definitions

Ch. 3: ER Model

- Create ER diagrams from English descriptions
- Answer questions about existing ER diagrams
- Cardinality and Participation
  - Cardinality (1:1, 1:N, M:N) encodes only **max**
  - Participation (total, partial) encodes only **min**
- Be able to interpret ER diagrams using *either* (min, max) *or* Cardinality / Participation
- Know ER Notation (Textbook Figure 3.14)

Ch. 4: EER Model

- §4.1 Subclasses, Superclasses, and Inheritance
- §4.2 Specialization and Generalization
- §4.3 Constraints and Characteristics of Specialization and Generalization Hierarchies
- §4.4 Modeling of UNION Types Using Categories
- **NO UML**

Ch. 5: The Relational Data Model and SQL

- §5.1 Domains, Attributes, Tuples, and Relations
  - **Bold** concepts and definitions
- §5.2 Relational Model Constraints and Relational Database Schemas
  - Be able to interpret relational schemas
    - Schema diagrams
    - Text schemas
  - Be able to bidirectionally convert between **English ⇔ Relational Schema**

- §5.3 Update Operations, Transactions, and Dealing with Constraint Violations
  - Given a schema and an operation (insert, modify, delete), be able to identify constraint violations
    - Domain constraint
    - Key constraint
    - Constraint on NULL
    - Entity integrity constraint
    - Referential integrity constraint
  - Be able to suggest a resolution other than simply rejecting the operation

Ch. 6: Basic SQL

- Be able to write syntactically correct SQL Queries
- §6.1 Data Definitions and Data Types
  - CREATE TABLE syntax and options
  - Data types
- §6.2 Constraints (*three categories*)
  - **Implicit** – inherent in the data model
  - **Explicit** – directly expressed in the schema of the data model (foreign keys, assertions, triggers)
  - **Semantic** – applications-based / business rules

Ch. 6: Basic SQL

- §6.3 Basic Retrieval Queries in SQL
  - The **`SELECT-FROM-WHERE`** Structure
  - Review textbook Query Examples
- §6.4 **`INSERT`**, **`DELETE`**, and **`UPDATE`** Statements in SQL
  - Review textbook Examples
  - Be able to predict *allowed* and *disallowed* operations (i.e. like Chapter 3: Relational Model)
    - Reason for disallowance (SQL constraint violations)

Ch. 7: Advanced SQL

- §7.1 More Complex SQL Retrieval Queries
  - §7.1.1 Comparisons Involving `NULL` and Three-Valued Logic
  - §7.1.2 Nested Queries, Tuples, and Set/Multiset Comparisons
  - **`EXISTS`** and **`UNIQUE`**
  - **`WHERE`** *attribute* **`IN`** *set*
  - §7.1.6 Joined Tables in SQL (Inner and Outer Joins)

- §7.1.7 Aggregate Functions
  - COUNT, SUM, MAX, MIN, AVG
  - Do not confuse COUNT with SUM (Caveat: beware of query descriptions that use the words "total" or "how many".
  - Cannot appear in WHERE clause
- §7.1.7 Ordering and Grouping
  - `ORDER BY` *attributes*
  - `GROUP BY` *attributes*
    `HAVING` *condition*
  - GROUP BY attributes *should* also appear in the SELECT clause
  - Attributes that are not in the GROUP BY clause and are non-unique *should not* appear in the SELECT clause.

Ch. 7: Advanced SQL

- ~~§7.2 Specifying Constraints as Assertions and Actions as Triggers~~ **(NOT INCLUDED)**
- §7.3 Views (Virtual Tables) in SQL
  - Know **`CREATE`** syntax
  - Know usage
- 7.4 Schema Change Statements in SQL for Schemas, Tables, Constraints
  - **`DROP`**
  - **`ALTER`**

Ch. 16: Disk Storage and Hashing

UTD

- 16.1 – Intro
- 16.2 – Secondary Storage Devices
- 16.3 – Buffering of Blocks
- 16.4 – Placing File Records on Disk
- 16.5 – Operations on files
- 16.6 – Files of Unordered Records (Heap Files)
- 16.7 – Files of Ordered Records (Sorted Files)
- T/F, Multiple Choice, Multiple Answer, Matching
- One or two problems similar to end-of-chapter Exercises 16.34–16.38

Ch. 16: Disk Storage and Hashing

- Type: Multiple Choice, Multiple Answer, Matching, T/F
- 16.8 Hashing Techniques
  - Extendible hashing (pages 578-580, 7th Ed.)
  - Dynamic hashing (page 580, 7th Ed.)
  - Linear hashing (pages 580-582, 7th Ed.)
- ~~16.9 Other Primary File Organizations~~ (EXCLUDED)
- 16.10 – RAID (Problem)
  - Hex ⇔ Binary
  - Hex-only XOR shortcut

Ch. 17: Indexing Structures for Files

- **Q Type**: Multiple Choice, Multiple Answer, Matching, T/F
- Single-level Ordered Indexes
  - Primary Indexes
  - Clustering Indexes
  - Secondary Indexes
- Multilevel Indexes
- Dynamic Multilevel Indexes: B-Trees and B^+-Trees
  - (**Hardcopy** Problem) B-tree *and/or* B^+-tree
  - Insert
  - Delete

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