REVIEW
for
MIDTERM EXAM

Chapters

- Ch. 1. Introductory Database Concepts (Chapter01.pdf)
- Ch. 2. Database Planning and Database Architecture (Chapter02.pdf)
- Ch. 3. The Entity-Relationship Model (Chapter03.pdf)
- Ch. 4. The Relational Model (Chapter04.pdf)

Ch. 1. Introductory Database Concepts (Chapter01.pdf)

- 1.1 Uses of Databases
  - Basic Definitions: Database, data, mini-world, DBMS, database systems
  - Big data
- 1.2 A Sample Database
- 1.3 The Integrated Database Environment
  - Database, DBMS, Users, Applications
- 1.4 Roles in the Integrated Database Environment
  - End users, application programmers, Database administrators

Ch. 1. Introductory Database Concepts (Chapter01.pdf)

- 1.5 Advantages of the Integrated Database Approach
  - Sharing of data throughout the enterprise
  - Control of redundancy
  - Data consistency
  - Improved data standards
  - Better data security, perhaps using encryption
  - Improved data integrity
  - Balancing of conflicting requirements
  - Faster development of new applications
  - Better data accessibility
  - Economy of scale
  - More control of concurrency
  - Better backup and recovery procedures

Ch. 1. Introductory Database Concepts

- 1.6 Historical Developments in Information Systems
  - Punched cards, punched paper tape, magnetic tape
  - Batch processing
  - Magnetic disks
  - Early database models:
    - Hierarchical model
    - Network model
    - Relational model
      - ER-diagrams
    - Object-oriented model
      - UML
    - Object-relational model
  - Data warehouses
  - Big data
    - Big data technologies
      - Hadoop
      - NoSQL
      - NewSQL

Ch.2. Database Planning and Database Architecture (Chapter02.pdf)

- 2.1. Data as a Resource
  - Motivation
- *2.2. Characteristics of Data*
  - Data and information
  - Levels of discussing data
    - Real world: Enterprise, mini-world
    - Conceptual model
    - Logical model of database-intension
    - Data occurences-extension
  - Data Sublanguages
    - **Data definition language (DDL)**
    - **Data manipulation language (DML)**

Ch.2. Database Planning and Database Architecture (Chapter02.pdf)

- *2.3. Stages in Database Design*
  - Analyze user environment
  - Develop conceptual data model
  - Choose a DBMS
  - Develop logical model, by mapping conceptual model to DBMS
  - Develop physical model
  - Evaluate physical model
  - Perform tuning, if indicated
  - Implement physical model
- *2.4 Design Tools*
  - Data dictionary
  - Project management software
  - Diagramming tools
    - E-R, UML diagrams
  - CASE (Computer-Aided Software Engineering) tools

Ch.2. Database Planning and Database Architecture (Chapter02.pdf)

- *2.5 Database Administration*
  - *Planning and Design*
    - Preliminary planning
    - Identifying user requirements
    - Developing and maintaining the data dictionary
    - Designing the conceptual model- may use E-R or UML diagram
    - Choosing a DBMS
    - Developing the logical model-writes schema
    - Developing the physical model
  - *Developing the Database*
  - *Database Management*

Ch.2. Database Planning and Database Architecture (Chapter02.pdf)

- *2.6 The Three-Level Database Architecture*
  - *External Views*
  - *Logical and Conceptual Models*
  - *Internal Model*
  - *Data Independence*

- *2.7 Overview of Data Models*
  - *Entity-Relationship Model*
  - *Relational and Other Record-Based Models*
  - *Object-Oriented Model*
  - *Object-Relational Model*
  - *Large-Scale Data Models*
    - *Star Schema*
    - *Data Cube*
    - *SeniOstructured Data Model*
    - *Key-Value Pairs*

Ch.3. The Entity-Relationship Model
(Chapter03.pdf)

- *3.1 Purpose of the E-R Model*
- *3.2 Entities*
- *3.3 Attributes*
  - *Domains*
  - *NULL Values*
  - *Multivalued Attributes*
  - *Composite Attributes*
  - *Derived Attributes*
- *3.4 Keys*
  - *Super Keys*
  - *Candidate Keys*
  - *Primary Keys*

Ch.3. The Entity-Relationship Model
(Chapter03.pdf)

- *3.5 Relationships*
  - *Degree of Relationships*
  - *Attributes of Relationships*
  - *Cardinality of a Binary Relationship*
  - *Showing Cardinalities on an E-R Diagram*
  - *Participation Constraints*
    - *Total Participation*
    - *Partial Participation*
    - *Using (min,max) Notation for Cardinality and Participation*

- *3.6 Roles*
- *3.7 Existence Dependency and Weak Entities*
- *3.8 Sample E-R Diagrams*
- *3.9 Rationale for Extending the E-R Model*

Ch.3. The Entity-Relationship Model
(Chapter03.pdf)

- *3.10 Generalization and Specialization*
  - *Specialization*
  - *Generalization*
  - Generalization Constraints—Disjointness, Completeness, Definition Method
  - Multiple Hierarchies and Inheritance
- *3.11 Union*
- *3.12 Sample EE-R Diagrams*

Ch.4. The Relational Model (Chapter04.pdf)

- *4.1 Advantages of the Relational Model*
- *4.2 Relational Data Structures*
  - *Tables*
  - *Mathematical Relations*
  - Database Relations and Tables
  - Properties of Relations
  - Degree and Cardinality
  - *Relation Keys*
- *4.3 Integrity Constraints:* domain, key, foreign key, general constraints
- *4.4 Representing Relational Database Schemas*

Ch.4. The Relational Model (Chapter04.pdf)

- *4.5 Relational Data Manipulation Languages*
  - *Categories of DMLs*
  - *Relational Algebra*
    - *SELECT*
    - *PROJECT*
    - *JOIN*
    - *Products and Joins*
      - *Theta Join, Equijoin, Natural Join*
      - The Semijoin and Outer Joins
    - *Complex Queries*
    - *Set Operations*
      - *Union, Intersection, Minus*
- *4.6 Views*
- *4.7* Mapping an E-R Model to a Relational Schema
- *4.8* Mapping an EE-R Model to a Relational Schema
  - Mapping EE-R Set Hierarchies to Relational Tables
  - *Mapping Unions*

Question Types

- Comprehensive exam
  - At least one question from each chapter
- Multiple choice questions
- True / False questions
- Matching