

- (All chapters begin with an Introduction end with a Summary, Exercises, and Reference and Bibliography)
- I Preliminaries
 - What is a database?
 - Relational systems and others
- 2 Database System Architecture
 - The three levels of the architecture
 - The external level
 - The conceptual level
 - Mappings
 - The database administrator
 - Data communications
 - Client/server architecture
- 1 An Overview of Database Management
 - The database management system
 - What is a database system?
 - Why database?
 - Data independence
 - The internal level
 - Utilities
- 3 An Introduction to Relational Databases
 - Relations and relvars
 - What relations mean
 - The catalog
 - Base relvars and views
 - Transactions
 - The suppliers-and-parts database
 - Transactions
 - Embedded SQL
 - Distributed processing
 - Optimization
 - The catalog
 - An informal look at the relational model
 - Overview
 - Views
- 4 An Introduction to SQL
 - Dynamic SQL and SQL/CLI
 - SQL is not perfect
- II The Relational Model
- 5 Types
 - Values v Variables
 - Types v Representations
 - Type Definition
 - Operators

- Type generators
- SQL facilities
- 6 Relations
 - Tuples
 - Relation types
 - Relation values
 - Relation variables
 - SQL facilities
- 7 Relational Algebra
 - Closure revisited
 - The original algebra: Syntax
 - Grouping and ungrouping
 - The original algebra: Semantics
 - Additional operators
 - Examples
 - What is the algebra for?
 - Further points
- 8 Relational Calculus
 - Tuple calculus
 - SQL facilities
 - Domain calculus
 - Query-By-Example
 - Predicates and propositions
 - Checking the constraints
 - Internal v external constraints
 - Integrity and views
 - A constraint classification scheme
 - Keys
 - SQL facilities
 - Examples
 - Computational capabilities
 - Calculus vs. algebra
 - A closer look
 - Relvar predicates and database predicates
 - Correctness v consistency
- 9 Integrity
 - Triggers (a digression)
- 10 Views
 - What are views for?
 - View retrievals
 - View updates
 - Snapshots (a digression)
 - SQL facilities
- III Database Design

- 11 Functional Dependencies
 - Basic definitions
 - Trivial and nontrivial dependencies
 - Closure of a set of dependencies
 - Closure of a set of attributes
 - Irreducible sets of dependencies
- 12 Further Normalization I: 1NF, 2NF, 3NF, BCNF
 - Nonloss decomposition and functional dependencies
 - First, second, and third normal forms
 - Dependency preservation
 - Boyce/Codd normal form
 - A note on relation-valued attributes
- 13 Further Normalization II: Higher Normal Forms
 - Multi-valued dependencies and fourth normal form
 - Join dependencies and fifth normal form
 - The normalization procedure summarized
 - A note on denormalization
 - Orthogonal design (a digression)
 - Other normal forms
- 14 Semantic Modeling
 - The overall approach
 - The E/R model
 - E/R diagrams
 - Database design with the E/R model
 - A brief analysis
- IV Transaction Management
 - 15 Recovery
 - Transactions
 - Transaction recovery
 - System recovery
 - Media recovery
 - Two-phase commit
 - Savepoints (a digression)
 - SQL facilities
 - 16 Concurrency
 - Three concurrency problems
 - Locking
 - The three concurrency problems revisited
 - Deadlock
 - Serializability
 - Recovery revisited
 - Isolation levels
 - Intent locking
 - ACID dropping

- SQL facilities
- V Further Topics
- 17 Security
 - Discretionary access control
 - Mandatory access control
 - Statistical databases
 - Data encryption
 - SQL facilities
- 18 Optimization
 - A motivating example
 - An overview of query processing
 - Expression transformation
 - Database statistics
 - Implementing the relational operators
- 19 Missing Information
 - An overview of the 3VL approach
 - Some consequences of the foregoing scheme
 - Nulls and keys
 - Outer join (a digression)
 - Special values
 - SQL facilities
- 20 Type Inheritance
 - Type hierarchies
 - Variables and assignments
 - Specialization by constraint
 - Comparisons
 - Operators, versions, and signatures
 - Is a circle an ellipse?
 - Specialization by constraint revisited
 - SQL facilities
- 21 Distributed Databases
 - Some preliminaries
 - The twelve objectives
 - Problems of distributed systems
 - Client/server systems
 - DBMS independence
 - SQL facilities
- 22 Decision Support
 - Aspects of decision support
 - Data preparation
 - Data warehouses and data marts
 - Online analytical processing
 - Data mining
 - SQL facilities

- 23 Temporal Databases
 - What is the problem?
 - Intervals
 - A divide-and-conquer strategy
 - Polymorphism and substitutability
 - Database design for decision support
 - Packing and unpacking relations
 - Generalizing the relational operators
 - Database work design
 - Integrity constraints
- 24 Logic-Based Databases
 - Overview
 - Propositional calculus
 - Predicate calculus
 - A proof-theoretic view of databases
 - Deductive database systems
 - Recursive query processing
- VI Objects, Relations, And Xml
- 25 Object Databases
 - Objects, classes, methods, and messages
 - A closer look
 - A cradle-to-grave example
 - Miscellaneous issues
- 26 Object / Relational Databases
 - The First Great Blunder
 - The Second Great Blunder
 - Implementation issues
 - Benefits of true rapprochement
 - SQL facilities
- 27 The World Wide Web and XML
 - The Web and the Internet
 - An overview of XML
 - XML data definition
 - XML data manipulation
 - XML and databases
 - SQL facilities
 - Appendixes
- Appendix A The TransRelational Model
 - Three levels of abstraction
 - The basic idea
 - Condensed columns
 - Merged columns
 - Implementing the relational operators
- Appendix B SQL Expressions, Table Expressions, and Boolean Expressions

- Appendix C Abbreviations, Acronyms, and Symbol
- Appendix D Online storage structures and access methods, database access: an overview, page sets and files, indexing, hashing, pointer chains, and compression techniques
- Index