

Syllabus

DSA5104

Review Terms (Week 1)

- Data types
 - Structured
 - Semi-structured
 - Unstructured
- Big data
 - 5Vs
- ETL - extract, transform and load

Review Terms (Week 2)

- Database-management system (DBMS)
- Data abstraction
 - Physical level
 - Logical level
 - View level
- Instance
- Schema
- Physical data independence
- Data models
- Database languages
 - Data-definition language (DDL)
 - Data-manipulation language (DML)
 - Query language
- Database Engine
 - Storage manager
 - Query processor
- Transactions
 - ACID
- Database/Application Architecture

Review Terms (Week 2)

- Table
- Relation
- Tuple
- Attribute
- Relation instance
- Domain
- Null value
- Database schema
- Database instance
- Relation schema
- Keys
- Primary key constraint
- Foreign key constraint
- Schema diagram
- Relational algebra
- Relational-algebra expression
- Relational-algebra operations

Review Terms (Week 2)

- SQL Parts
 - DDL, DML, Integrity constraints
- SQL Data Definition
 - CREATE TABLE (integrity constraints), Domain types
- Basic Query Structure of SQL Queries
 - SELECT, FROM, WHERE
- Additional Basic Operations
 - rename, string, ORDER BY
- Set Operations
- Null Values
 - Result of arithmetic expression -> Null
 - Result of comparison / boolean operation -> Unknown
 - WHERE clause
- Aggregate Functions
 - GROUP BY, HAVING
- Nested Subqueries
 - Where can a nesting query be used?

Review Terms (Week 3)

- Aggregation with Null Values
- Nested Subqueries
 - Test for Empty Relations - **exists / not exists**
 - Correlation Name
 - Test for Absence of Duplicate Tuples - **unique / not unique**
 - **with** Clause
 - Scalar Subqueries
- Modification of the Database
 - **delete / insert / update**
 - **Case** Statement for Conditional Updates
- Join Expressions
 - Natural join
 - Inner join
 - Outer join (left, right, full)
 - **on**
- Integrity Constraints
 - **Not null / unique / check(P)**
 - FK constraint

Review Terms (Week 4)

- Steps in Database Design
- Data Model / Schema
 - ER Model
 - Relational Model
- Entity Relationship Data Model
 - ER Diagram
- Entity and Entity Set
 - Complex Attribute
- Key
 - Superkey, Candidate key, Primary key
- Relationship and relationship set
 - Binary relationship set
 - Degree of relationship set
 - Descriptive attributes
 - Superkey, candidate key, and primary key
 - Role
- Mapping cardinality
- Total and partial participation
- Weak entity sets and strong entity sets
- Specialization and generalization
- Aggregation

Review Terms (Week 4)

- Functional dependencies
- Key
- Update/Insert/Delete anomaly
- Reasoning about FDs
- F^+ (closure of FDs F)
- Armstrong's Axioms
- Attribute closure
- BCNF
- Decomposition

Tasks

- Given schema and natural language query, write SQL and relational algebra query.
- Given application description, conduct conceptual design and logical design using ER and relational data model.
- Given a schema and some FDs, identify if there is any refinement needed.
 - Identify if a relation is in BCNF
 - Conduct decomposition when needed