Chapter 2

The Relational Model
Transparencies

Chapter 2 - Objectives

- Define the term data model.
- Terminology of relational data model.
- How tables are used to represent data.
- Properties of database relations.
- How to identify candidate, primary, and foreign keys.
- Meaning of entity integrity and referential integrity.

Data Model

- Integrated collection of concepts for describing data, relationships between data, and constraints on the data.

- Has three components:
  - a structural part;
  - a manipulative part;
  - a set of integrity rules.

RM Terminology

- Relation: table with columns and rows.
- Attribute: named column of a relation.
- Domain: set of allowable values for one or more attributes.
- Tuple: a record of a relation.
- Relational Database - collection of normalized relations with distinct relation names.

Instances of Branch and Staff (part) Relations
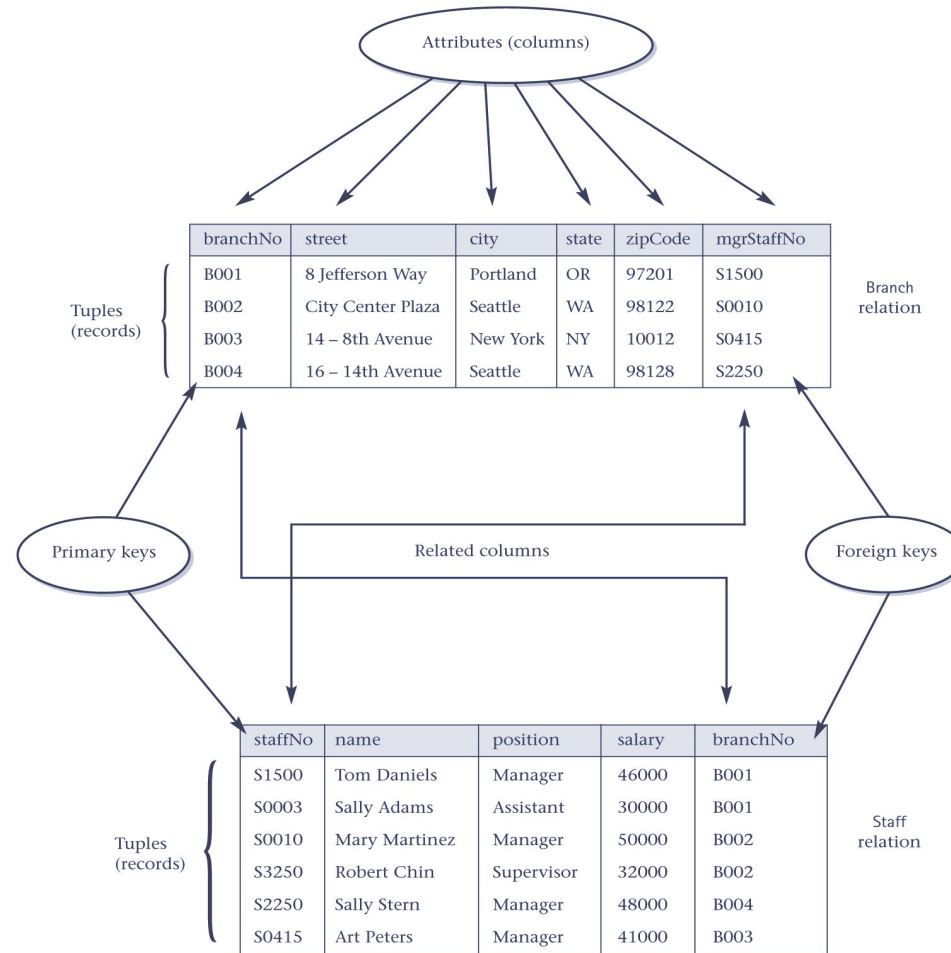
Example Attribute Domains

Attribute	Domain name	Meaning	Domain definition
branchNo	Branch_Numbers	Set of all possible branch numbers.	Alphanumeric: size 4, range B001–B999
street	Street_Names	Set of all possible street names.	Alphanumeric: size 60
staffNo	Staff_Numbers	Set of all possible staff numbers.	Alphanumeric: size 5, range S0001–S9999
position	Staff_Positions	Set of all possible staff positions.	One of Director, Manager, Supervisor, Assistant, Buyer
salary	Staff_Salaries	Possible values of staff salaries.	Monetary: 8 digits, range $10,000.00–$100,000.00

Alternative Terminology

- Relation, attribute, tuple
- Table, column, record
- File, field, row
- Combinations thereof.

Properties of Relations

- Table name is distinct from all other table names in the database.
- Each cell of table contains exactly one atomic (single) value.
- Each column has a distinct name.
- Values of a column are all from the same domain.

Properties of Relations

- Each record is distinct; there are no duplicate records.
- Order of columns has no significance.
- Order of records has no significance, theoretically.

Relational Keys

- ## Superkey
  - A column, or a set of columns, that uniquely identifies a record within a table.

- ## Candidate Key
  - Superkey (K) such that no proper subset is a superkey within the table.
  - In each record, values of K uniquely identify that record (*uniqueness*).
  - No proper subset of K has the uniqueness property (*irreducibility*).

Relational Keys

- **Primary Key**
  - Candidate key selected to identify records uniquely within table.
- **Alternate Keys**
  - Candidate keys that are not selected to be primary key.
- **Foreign Key**
  - Column, or set of columns, within one table that matches candidate key of some (possibly same) table.

Relational Integrity

- Null
  - Represents value for a column that is currently unknown or not applicable for record.
  - Deals with incomplete or exceptional data.
  - Represents the absence of a value and is not the same as zero or spaces, which are values.

Relational Integrity

- ## Entity Integrity
  - In a base table, no column of a primary key can be null.

- ## Referential Integrity
  - If FK exists in a table, either FK value must match a candidate key value of some record in its home table or FK value must be wholly null.

Relational Integrity

○ **Business Rules**

  • **Rules that define or constrain some aspect of the organization.**