Comp 5311 Database Management Systems

15. Review 1
Main Topics

• ER model
• Relational model
• SQL
Symbols of ER Diagram

- **E**  Entity Set
- **E**  Weak Entity Set
- **R**  Relationship Set
- **R**  Relationship Set for Weak Entity Set
- **A**  Primary Key
- **A**  Attribute
- **A**  Multivalued Attribute
- **A**  Derived Attribute
- **A**  Total Participation of Entity Set in Relationship
- **A**  Discriminating Attribute of Weak Entity Set
Symbols of ER Diagram (Cont.)

- Many to Many Relationship
- Many to One Relationship
- One to One Relationship
- Role Indicator
- Role Name
- Cardinality Limits
- ISA (Specialization or Generalization)
- Total Generalization
- Disjoint Generalization
- ISA
E-R Diagram of a Bank

- account
  - account-number
  - balance
- account-branch
  - branch-name
  - branch-city
  - assets
- branch
  - loan-branch
- customer
  - customer-name
  - customer-city
  - customer-street
- borrower
- loan
  - loan-number
  - amount
Relational Model

- Relations: schema and instances
- Attributes: single-valued, domain, keys
- Set of records: no duplicates, no order
- Formal query languages:
  - Relational algebra (RA)
- Automatic conversion between relational and ER
Relational Schema of the Bank

branch (branch-name, branch-city, assets)
customer (customer-name, customer-street, customer-city)
account (account-number, branch-name, balance)
loan (loan-number, branch-name, amount)

depositor (customer-name, account-number)
borrower (customer-name, loan-number)

Keys are underlined and foreign keys are in italics.
Relational Algebra

• Basic operations:
  – Selection ( σ )
  – Projection ( π )
  – Cross-product ( × )
  – Set-difference ( - )
  – Union ( ∪ )
  – renaming ( ρ )

• Additional operations:
  – Intersection, join, division
SQL Query Block

SELECT select-clause
FROM from-clause
[WHERE where-clause]
[ORDER BY order-by-expression]
[GROUP BY group-by-attributes]
[HAVING condition-for-each-group]]

Query blocks may be nested in FROM and WHERE; may be connected using UNION, INTERSECT, and EXCEPT.
SQL Features

- Duplicates: DISTINCT.
- Aggregation queries (e.g., max, sum) return a single value, unless there is a group by
- All non-aggregation attributes in SELECT with a GROUP BY must also appear in GROUP BY.
- If a attribute appears in GROUP BY, it may not necessarily appear in SELECT