CS315: Principles of Database Systems
Entity-Relationship Diagram

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- A relationship set is a relation among two or more entities, each taken from an entity set, e.g., person is a depositor for an account
- Relationship sets can also have attributes, e.g., access date for depositor
- Primary keys of entity sets form a superkey of the relationship set

Model (contd.)

- Relationships between two entity sets are *binary*
  - It is rare to have more than degree two
- Cardinality constraints for binary relationships can be one-to-one, one-to-many, many-to-one or many-to-many

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- Specialization, generalization, aggregation are features of extended ER model

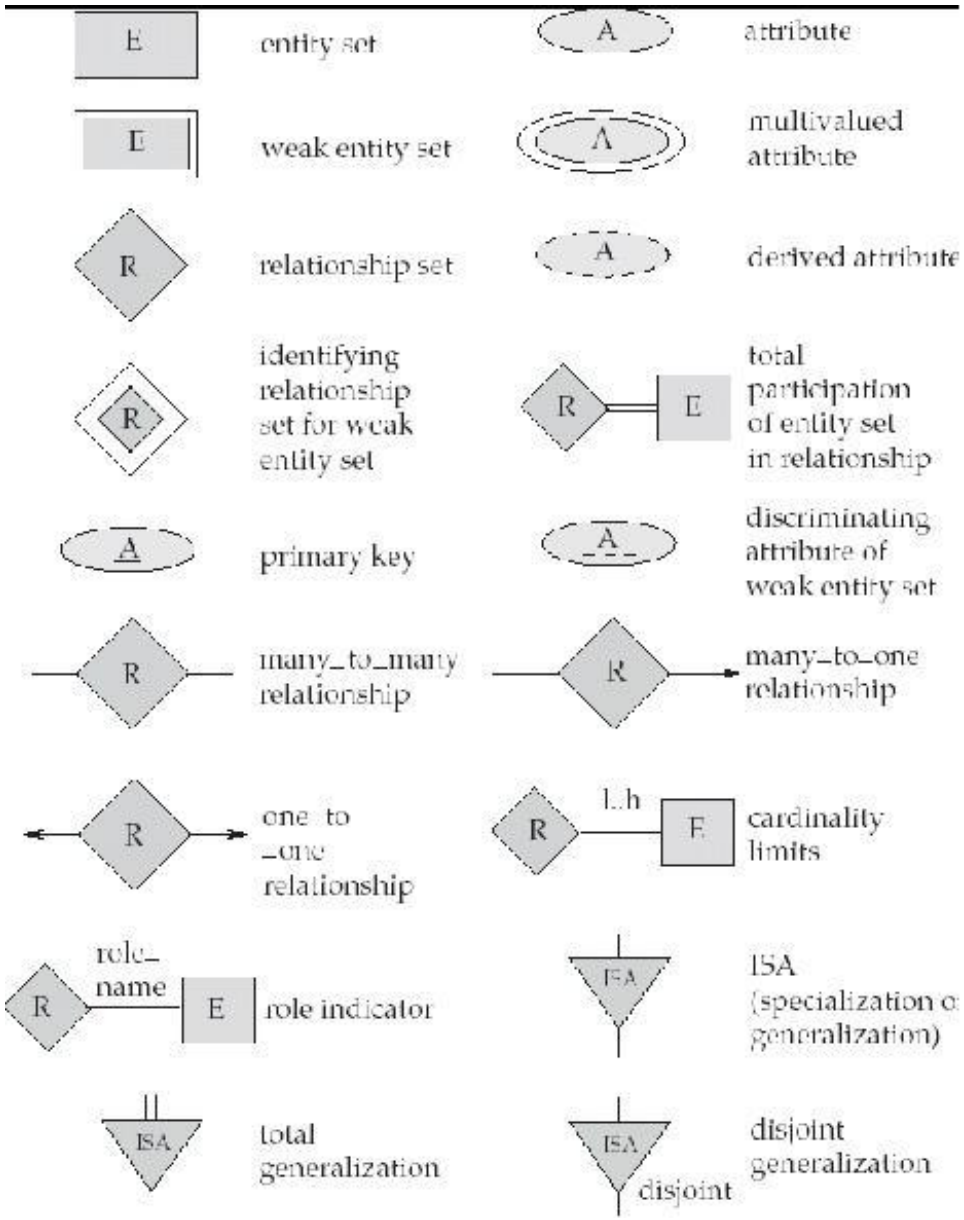
Weak entity sets

- An entity set that does *not* have a primary key is called a weak entity set
- Its existence depends on the existence of another entity set called the identifying entity set or owner entity set
- The identifying relationship set that exists between the two must be *total* and *many-to-one* from the weak entity set
- A weak entity set has a *discriminator* or partial key instead of a primary key
- The discriminator distinguishes weak entities that are related to the same entity of the identifying entity set
- The *primary key* is formed by the primary key of the identifying set and the discriminator

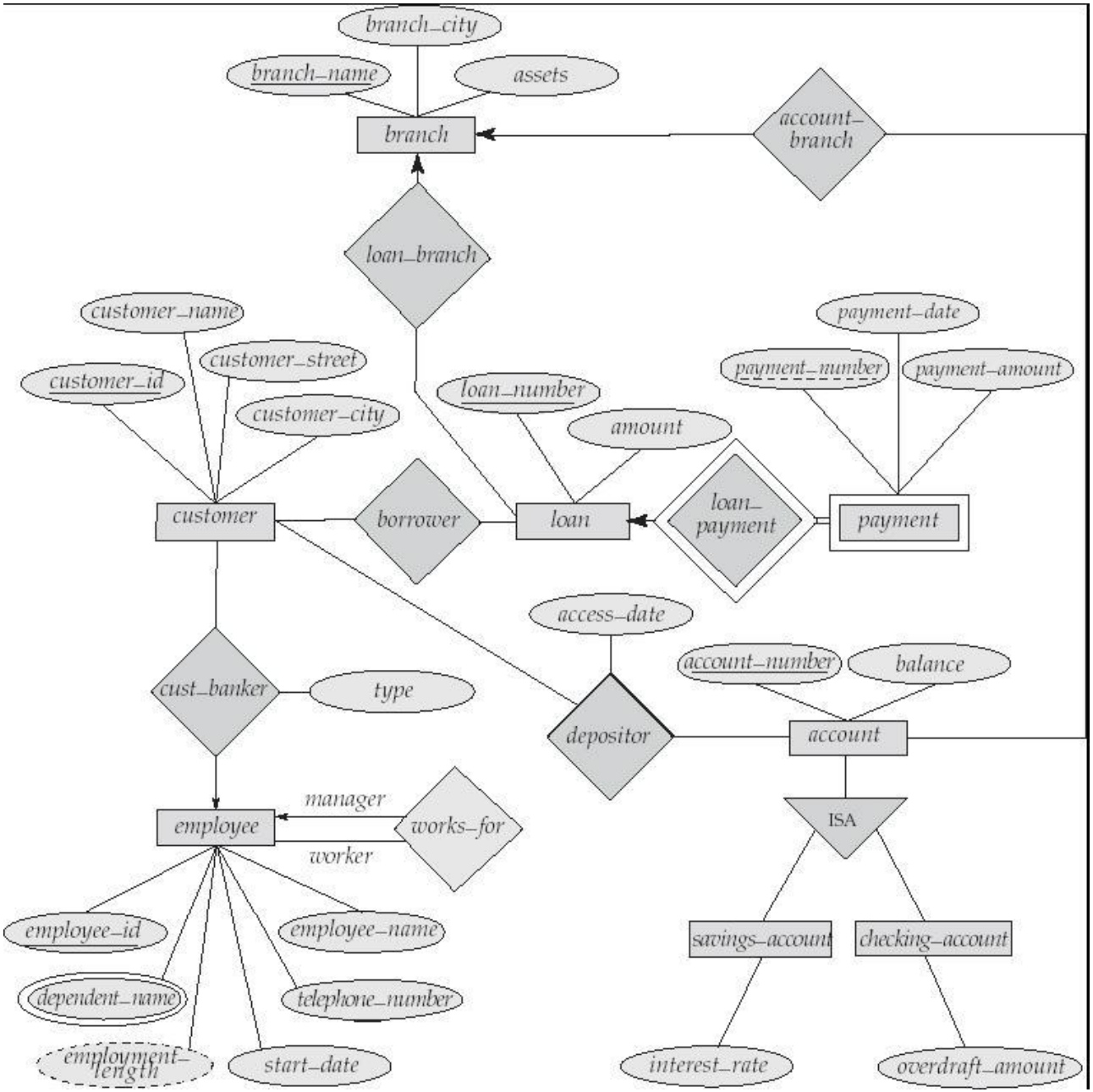
ER diagram

- Entity sets: rectangles
- Relationship sets: diamonds
- Attributes: ellipses
  - Multivalued attributes: double ellipses
  - Derived attributes: dashed ellipses
- Primary keys: underlines
- Roles: on links
- Cardinality constraints
  - One: directed
  - Many: undirected
  - One-to-many: directed-diamond-undirected
- Participation
  - Total: double line
  - Partial: single line
- Cardinality limits: on lines
- Weak entity sets: double rectangle
- Weak relationship set: double ellipse
- Discriminator of a weak entity sets: underline with dashed lines

Summary of ER diagram



Example: banking schema



Reduction to relational model

- Entity sets and relationships sets are reduced uniformly to relations
- A weak entity set is reduced to a relation by including the primary key attributes of the identifying set
  - A foreign key relationship is set up
- Many-to-one and one-to-many relationships that are total on the many side may not be reduced to a relation
  - Primary key of entity on “one” side is added to relation of entity on “many” side
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- Many-to-many relationships

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- Many-to-many relationships must be reduced to relations
- Each component of a composite attribute is modeled separately
- Multivalued attributes

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- Each component of a composite attribute is modeled separately
- Multivalued attributes are reduced to relations that include the primary key of the entity set