Representing Multi-Valued Attributes as Tables

- For a multi-valued attribute $M$, create a table $T$ that has a column for the multi-valued attribute and, additionally, columns for the primary key of the entity or relationship set of which $M$ is an attribute.

Entity Set:

$$employee (e\text{-social\text{-}security, employee\text{-}name, telephone\text{-}number, dependent\text{-}name})$$

Tables:

$$employee (e\text{-social\text{-}security, employee\text{-}name, telephone\text{-}number})$$

$$dependent\text{-}name (dname, e\text{-social\text{-}security})$$
Representing One-To-Many Relationship Sets as Tables

- A many-to-one relationship set from E1 to E2 can be represented as a table just like a many-to-many relationship. Technically this is not necessary, and in some cases it is not appropriate.

Entity Sets:

- account (account-number, balance)
- branch (branch-name, branch-city, assets)

Relationship Set (total and many-to-one from account to branch):

- account-branch (account-number, branch-name)

- The above could be converted to tables directly, or as follows:

  - account (account-number, balance, branch-name)
  - branch (branch-name, branch-city, assets)

- Since the above relationship is total, a distinct table for the relationship is probably not necessary.
Process Issues

The book defines the following engineering process steps (page 49):

• Specification of user requirements
• Conceptual-design
• Specification of functional requirements
• Logical-design
• Physical-design

*Note that the development/design steps, i.e., the process, is typically company specific.
How these Terms Relate

• If there is a relationship set between entity sets $E1$ and $E2$, and if the involvement of one of these entities, say $E1$, is total, then $E1$ may be, but is not necessarily existence dependent on $E2$ (Counter example: students and advisors).

• If one entity set $E1$ is existence dependent on another entity set $E2$, then there will be a relationship set between $E1$ and $E2$ in which the involvement of $E1$ is total.

• An entity set $E1$ may be involved, in a total way, in a relationship with some other entity set $E2$, but that does not necessarily mean that $E1$ is weak (Counter example: students and advisors).

• If an entity set is weak then, in order to be meaningful, it will always participate, in a total way, with another entity set in a one-to-many relationship.

• If an entity set $E1$ is weak, does that mean it is also existence dependent on some other entity set $E2$?

• If an entity set $E1$ is existence dependent on some other entity set $E2$, does that mean that it is also weak?
Definitions from the Book:

- An entity set that has a primary key is termed a *strong* entity set.
- An entity set that has no primary key is termed a *weak* entity set.
- An entity $x$ is said to be *existence dependent* on an entity $y$, if $x$ cannot exist without $y$, i.e., if $y$ is deleted, then so is $x$.
- The participation of an entity set $E$ in a relationship set $R$ is said to be *total* if every entity in $E$ participates in at least one relationship in $R$. Otherwise, the relationship is said to be *partial*.

*Question*: What is the difference between these three concepts (*strong/week, existence dependence, and totality*), or are they the same?