Database Management System (DBMS)

Lecture-9

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Keys

A key allows us to identify a set of attributes that suffice to distinguish entities from each other. Keys also help uniquely identify relationships, and thus distinguish relationships from each other.

Keys defined on entity sets

Superkey
A superkey is a set of one or more attributes that, taken collectively, allow us to identify uniquely an entity in the entity set.

E-R model

Candidate key
A superkey is said to be a candidate key if no proper subset of it is a superkey.
In another words, a minimal superkeys are a candidate keys.

Primary key
Out of all possible candidate keys, the database designer chooses one as a primary key. That is, a primary key is a candidate key that is chosen by the database designer.

Alternate key
The candidate keys which are not selected as a primary key, are called alternate keys.

Composite key
Any key is said to be composite key if it consists of more than one attributes.

E-R model

Example: Consider entity set student with attributes (rollNo, name, branch, address, mobileNo).

Superkeys: {rollNo}, {rollNo, name}, {rollNo, address}, {mobileNo},{name, mobileNo}.

Candidate keys: {rollNo}, {mobileNo}.

Primary key: {rollNo}

Alternate key: {mobileNo}.

Composite keys: {rollNo, name}, {rollNo,address}, {name, mobileNo}.

Relationship keys

Let R be a relationship set involving entity sets $E_1, E_2, ..., E_n$. Let primary-key(E_i) denote the set of attributes that forms the primary key for entity set E_i.

- If the relationship set R has no attributes associated with it, then the set of attributes primary-key(E_1) ∪ primary-key(E2) ∪ · · · ∪ primary-key(En) describes an individual relationship in set R.
- If the relationship set R has attributes a1, a2, · · · , am associated with it, then the set of attributes primary-key(E_1) ∪ primary-key(E_2) ∪ · · · ∪ primary-key(E_n) ∪ $\{a_1, a_2, ..., a_m\}$ describes an individual relationship in set R.

E-R model

In both of the above cases, the set of attributes primary-key(E_1) $\cup$ primary-key(E_2) $\cup \cdots \cup$ primary-key(E_n) forms a **superkey** for the relationship set.

The structure of the **primary key** for the relationship set depends on the mapping cardinality of the relationship set.

E-R model

Example: consider the entity sets customer and account, and the relationship set depositor, with attribute access-date.
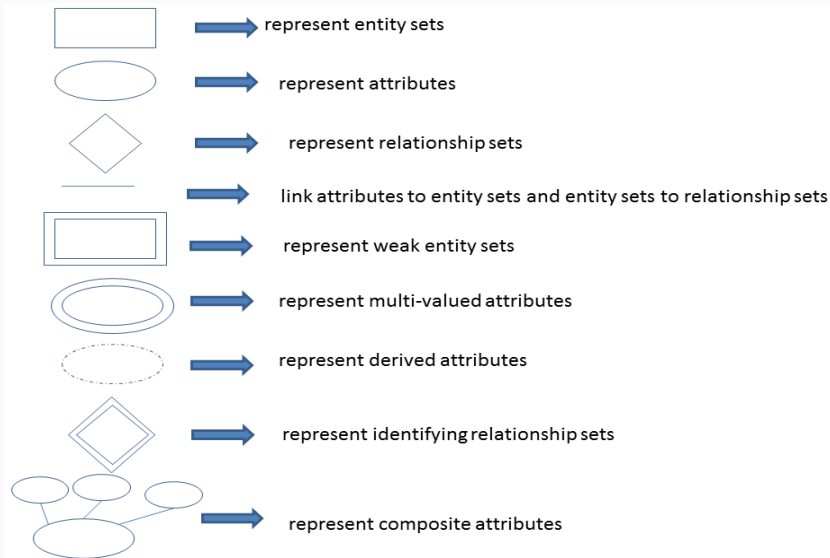
> **Case 1:** If the relationship set is many to many. Then the primary key of depositor consists of the union of the primary keys of customer and account.
>
> **Case 2:** If the depositor relationship is many to one from customer to account, then the primary key of depositor will be the primary key of customer.
>
> **Case 3:** If the depositor relationship is many to one from account to customer, then the primary key of depositor will be the primary key of account.
>
> **Case 4:** If the depositor relationship is one to one from customer to account, then the primary key of depositor will be either the primary key of customer or the primary key of account.
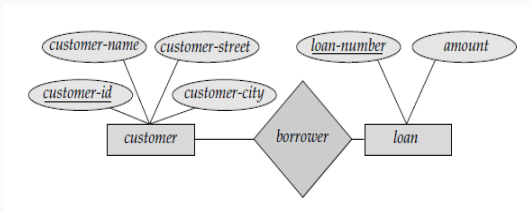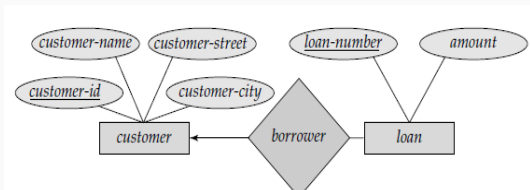
Entity-Relationship Diagram

▭	→ represent entity sets
⬭	→ represent attributes
◇	→ represent relationship sets
—	→ link attributes to entity sets and entity sets to relationship sets
▭▭	→ represent weak entity sets
⬭⬭	→ represent multi-valued attributes
⬭ (dashed)	→ represent derived attributes
◇◇	→ represent identifying relationship sets
⬭⬭⬭	→ represent composite attributes

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Some E-R diagram examples

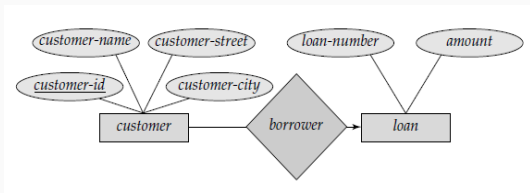**Example:** E-R diagram showing many to many relationship between customer and loan entity set.

Example: E-R diagram showing one to many relationship between customer and loan entity set.
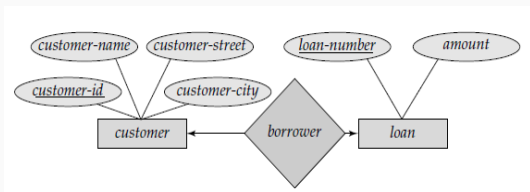
Some E-R diagram examples

Example: E-R diagram showing many to one relationship between customer and loan entity set.
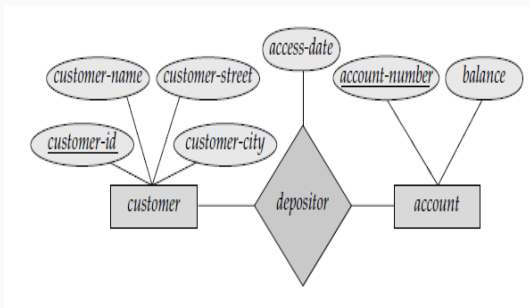

Example: E-R diagram showing one to one relationship between customer and loan entity set.

Some E-R diagram examples

Example: E-R diagram showing descriptive attributes associated with a relationship set.

Some E-R diagram examples

Example: E-R diagram showing composite, multi-valued and derived attributes.