RELATIONAL MODEL CONCEPTS

- A relation schema, denoted $R(A_1, A_2, ..., A_n)$, is made up of a name R and a list of attributes $A_1, A_2, ..., A_n$.
- A domain of an attribute is a set of valid values for the attribute.
- A relation of the relation schema $R(A_1, A_2, ..., A_n)$, denoted by r(R), is a set of n-tuples $r = \{t_1, t_2, ..., t_m\}$, where

  $t_i = <v_{i1}, v_{i2}, ..., v_{in}>$ and $v_{ij} \in Dom(A_j)$.
- The degree of a relation is the number of the attributes n in its relation schema.

RELATIONAL CONSTRAINTS AND RELATIONAL DATABASE SCHEMAS

- A superkey of the relation schema is a subset of the attributes *SK*, such that for any two tuples $t_1, t_2 \in r(R)$ $t1[SK] \neq t2[SK]$. In other words, the value of a superkey uniquely identifies the tuple.
- A key *K* of the relation schema R is a superkey, such that any proper subset of *K* is not a superkey. In other words, a key is a minimal superkey.
- The primary key is a key that is chosen to be the primary key.
- A relational database schema is a set of relation schemas $S = \{R_1, R_2, ..., R_n\}$ and a set of integrity constraints.

INTEGRITY CONSTRAINTS

- Domain constraint: $V_i \in Dom(A_i)$.
- Key constraint: key must be unique.
- Entity integrity constraint: no primary key value can be null.
- Referential integrity constraint: a tuple in one relation that refers to another relation must refer to an existing tuple in that relation, e.g. A STUDENT who Takes COURSE must take an existing course.

ER-TO-RELATIONAL MAPPING

Step 1. For each entity E,

1) Create a relation R_E that includes all the simple attributes and simple component attributes of a composite attribute;

2) Choose one of the key attributes as primary key.

Step 2. For each weak entity W with owner entity E,

1) Create a relation R_W that includes all the simple attributes and simple component attributes of a composite attribute;

2) Include as foreign key attributes in R_W the primary key of R_E that corresponds to E;

3) The primary key of R_W is the combination of the primary key of R_E and the partial key of W.

ER-TO-RELATIONAL MAPPING

Step 3. For binary 1:1 relationship with participating entities E1 and E2,

1) Choose one of the relation, say R_{E1}, and include as foreign key in R_{E1} the primary key of R_{E2};

2) Include the simple attributes and simple component attributes of the relationship as attributes of R_{E1}.

Step 4. For binary 1:N relationship with participating entities E1 and E2 (N-side),

1) Include as foreign key in R_{E2} the primary key of R_{E1};

2) Include the simple attributes and simple component attributes of the relationship as attributes of R_{E2}.

ER-TO-RELATIONAL MAPPING

Step 5. For binary M:N relationship with participating entities E1 and E2,

1) Create a relation R that includes all the simple attributes and simple component attributes of the relationship;

2) Include as foreign key attributes in R the primary key of R_{E1} and R_{E2};

3) The primary key of R is the combination of the primary key of R_{E1} and that of R_{E2}.

ER-TO-RELATIONAL MAPPING

Step 6. For each N-nary relationship with participating entities E1, E2, …, En,

1) Create a relation R that includes all the simple attributes and simple component attributes of the relationship;

2) Include as foreign key attributes in R the primary key of R_{E1}, R_{E2}, …, and R_{En};

3) The primary key of R is the combination of the primary key of R_{E1}, that of R_{E2}, …, and that of R_{En}.

ER-TO-RELATIONAL MAPPING

Step 7. For each multi-valued attribute A of E,

1) Create a relation R_A that includes A as an attribute;

2) Include as foreign key in R_A the primary key of R_E;

3) The primary key of R_A is the combination of A and the primary key of R_E.