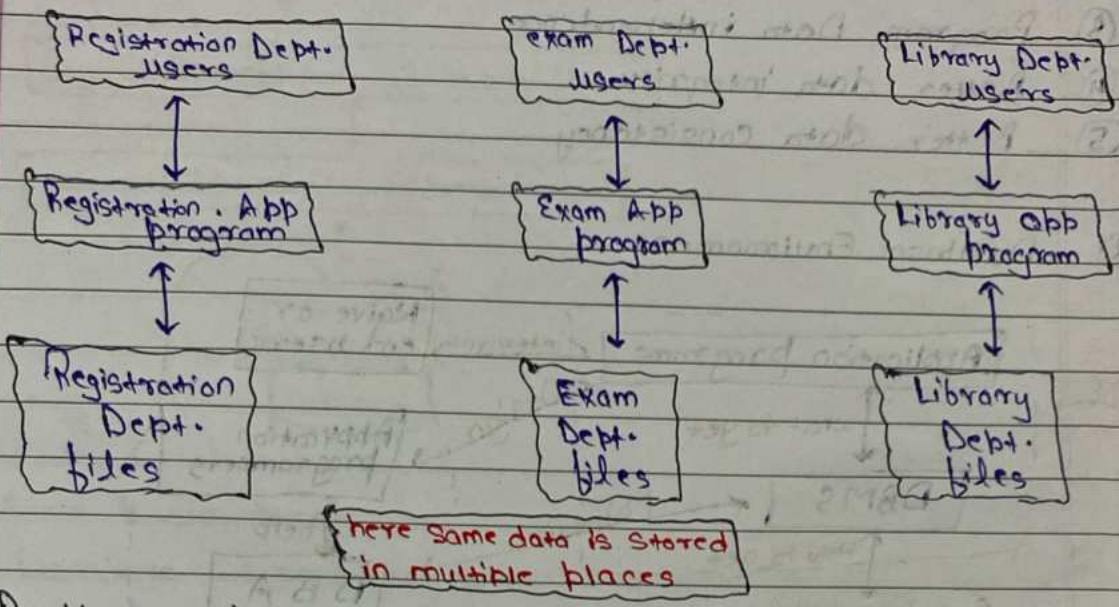
⊗ File processing system (FPS)



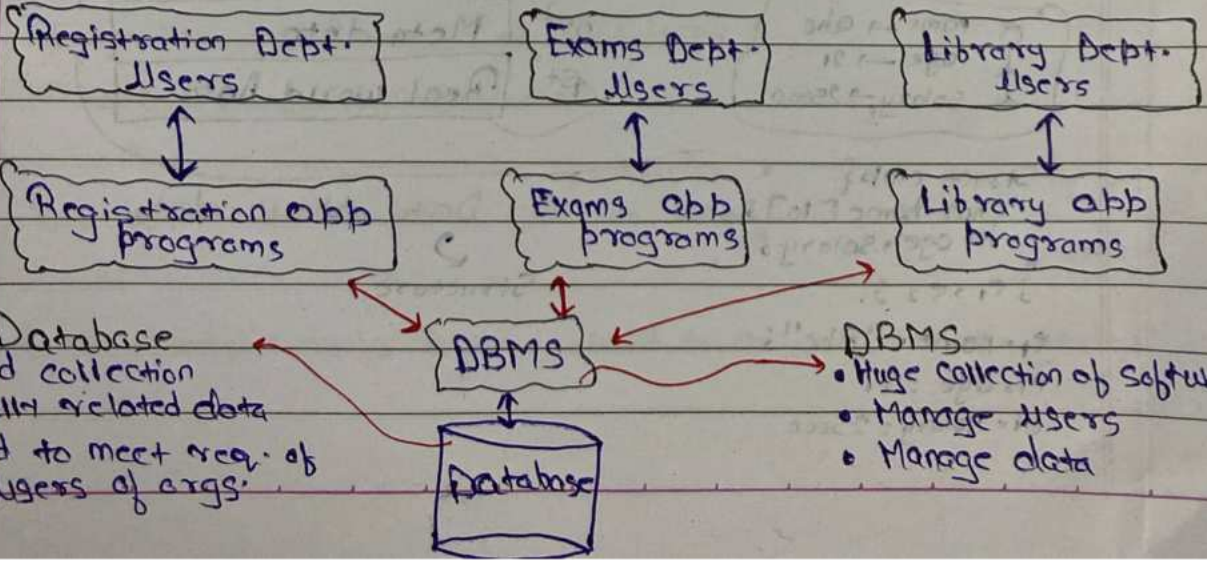
Problems with FPS

① Redundancy → Repetation of data
② inconsistency
③ Program data interdependent

inconsistency is a major issue which was due to redundancy exist

bcz of these problems, FPS is rejected and a new approach came

⊗ Database approach



Database
- Shared collection
- logically related data
- Stored to meet req. of diff. users of orgs.

DBMS
- Huge collection of software
- Manage users
- Manage data

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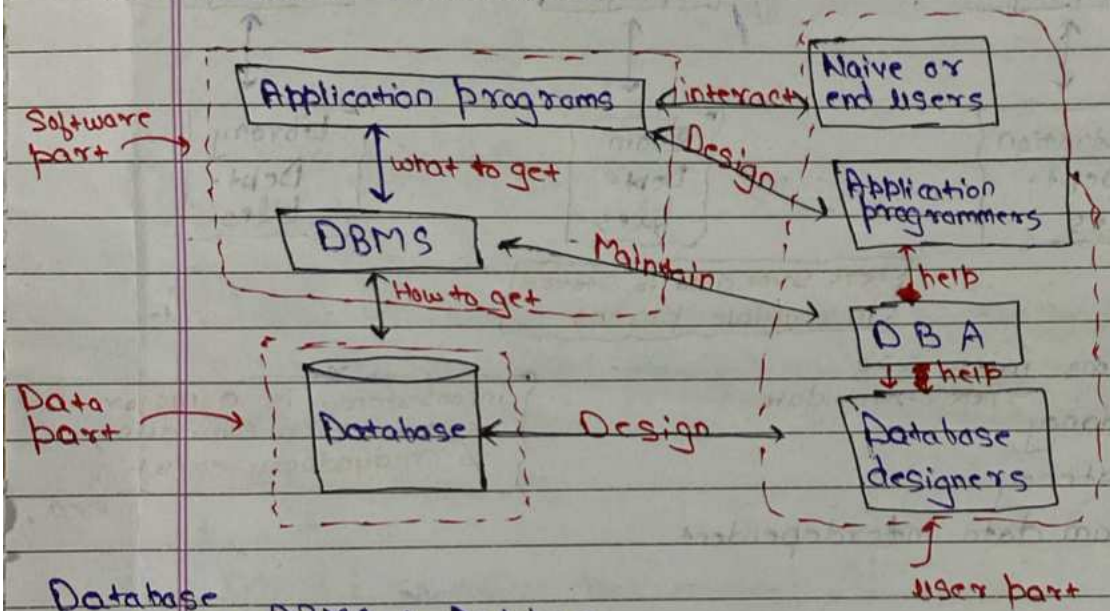
→ Advantages of Database approach

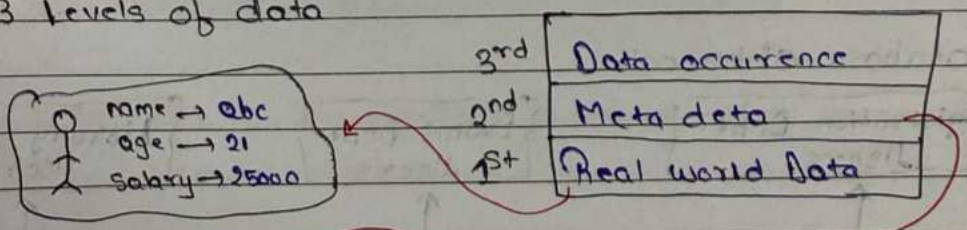
① Data Sharing
② Reduced redundancy
③ Program Data independence
④ Better data integrity
⑤ Better data consistency

⑥ Database Environment



Database System = DBMS + Database

⑦ 3 Levels of data




```
Struct emp{
 char name[10];
 int age, salary;
}e1, e2;
e1.name = "Abc";
e1.age = 21
e1.salary = 25000
```

Data about data
↓
Structure

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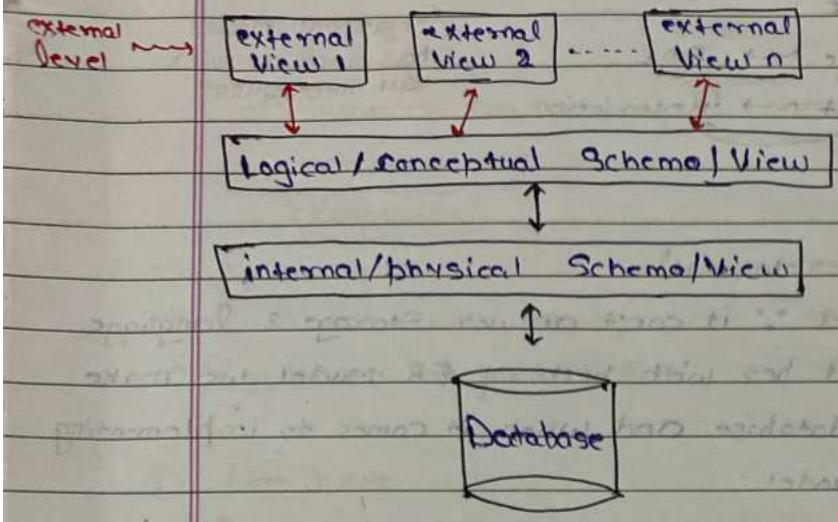
(2) DBMS architecture (3 level)



Some basic terms

(1) Database : organized collection of data that can be easily accessed, managed and updated.

- Stored in a structured way to minimize redundancy and improve efficiency

(2) DBMS : software that manages the database
Ex: MySQL, Oracle, SQL Server

(3) Data dictionary : database about database

(4) Intention vs Extension of Database
Structure → Schema ↔ Metadata ↔ Intention

(5) Database Model : Also Schema itself (↑ Structure)

(6) Data Model : tools which is used to design database Model

Data Model → ER Model
Data Model → Relational Model

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Data Model is complete if it answers the following

Q-(i) Storage ⇝ Table
Q-(ii) Manipulation language ⇝ SQL
Q-(iii) Integrity constraint ⇝ Restriction
"correct"

Relational Model has done answer all these ques^n

⊗ ER Model (entity-relational)
Not a complete model ∵ it can't answer storage & language
We will still study it bcz with help of ER Model we make high level design of database and when it comes to implementing we use relational model

Jo non-technical insaan ko bhi smjh aajaye

Tools or construction in ER model
→ entity → entity type, entity instance, entity set
→ Attributes
→ Relationships

⊗ entity type
Name or lable assigned to items or objects that exist in an environment & have similar properties.

⊗ entity instance
A particular object belonging to particular entity type.

⊗ entity Set
collection of all the entity instances of particular entity type

Types of entity types (E·T)

Strong E·T	Weak E·T
→ instances can exist independently	→ instances can exist without being linked with some other E·T
{Employee}	{Dependents}
→ Primary key ✓	→ Primary key ✗
→ Dominent entity instance	→ Subordinate entity instance
→ Regular or independent E·T	→ Dependent E·T

⊗ Attributes

→ Properties of entity type

→ entity type employee has attributes like name, age, Salary etc.

→ Value of attributes → Entity instances

Domain of attribute

→ Set of value an attribute can have

Eg· age of employee must be ≥ 18 and ≤ 60

Domain of age = {18, 19, 20, ..., 60}

→ Value of attribute must come from its respective domain

⊗ Types of attributes

① Simple Vs Composite

atomic ✓ atomic ✗

② Single valued Vs Multiple valued

③ Stored Vs Derived

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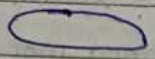
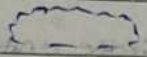
⊗ Symbols in ER Model

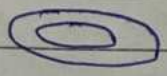
① Simple, Single valued & Stored



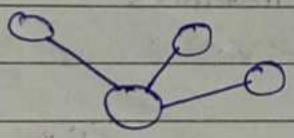
② Simple, Single valued & derived



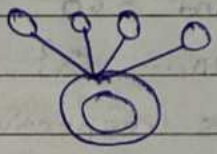
③ Simple, Multivalued & Stored



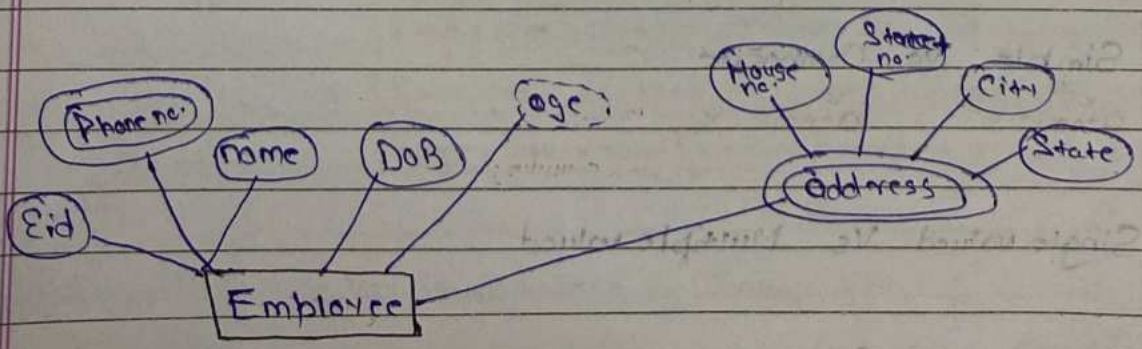
④ Composite, Single valued & Stored



⑤ Composite, Multivalued & Stored



Example:



⑧ Keys

→ Attribute act as differentiating agents among different entity types

→ If we have entity instances of some entity type then differentiating agent is a key

→ key is an attribute or set of attributes which uniquely identify instances of particular entity type

ex: employees ke andr kisi ek ko diff. krna is key. his id is the key

Types of Keys

① Super key ② Candidate key ③ Primary key
④ Alternate / Secondary key ⑤ foreign key.

① Super key :-

→ An attribute or set of attributes which uniquely identify instance of particular entity type

→ Most general key is super key

→ Unique identification means super key → {id card}, {name, father name}

② Candidate key :-

An attribute or set of attribute which uniquely & minimally identify instances of particular entity type

for ex: {E-id} ⇝ both super as well as candidate key
{E-id, name} ⇝ not candidate key, but super key
{E-id, name, age} ⇝ not candidate key but super key
{name, father name} ⇝ both candidate as well as super key

Note : Candidate key is a subset of Super key

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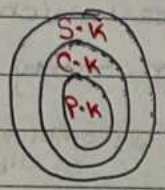
③ Primary key :-

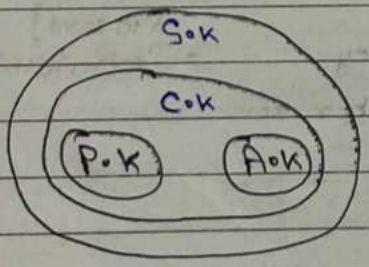
→ One of the eligible candidate key is choosen as primary key
→ We can have more than one candidate key also
→ When tables are defined then primary key should be defined so that we can apply queries efficiently.



Denoted by underline

④ Alternate / Secondary key

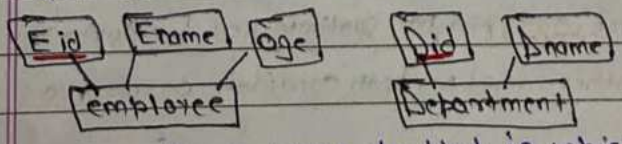
→ except primary key, Rest all Candidate keys become alternate keys
→ For any entity type, only one primary key but many alternate keys are possible



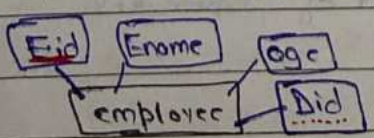
⑤ Foreign key

Denoted by dotted line below the attribute

→ An attribute of one entity type acting as primary key with another entity type



if we want to find in which department a employee work



Eid	Ename	age	Did
E101	x	25	D101
E102	y	26	D102
E103	x	25	D102

Primary key	Foreign key
① Unique	① Duplicate
② Cannot be null	② Can be null

Reference Integrity constraint :-

F·k ⊆ P·k

Foreign key is a subset of primary key.

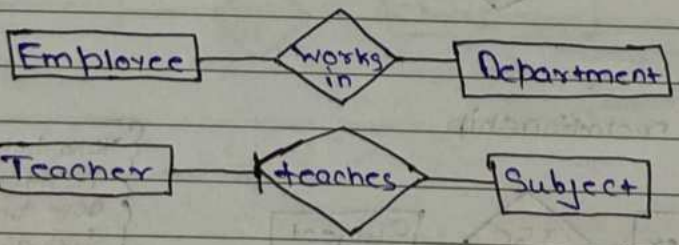
~~Hum wo value F·k mai dal hi nhi skte jo P·k mai nhi thi~~

⑧ Relationships

→ A relation is an association or linkage or connection blw the instances of different entity types.

→ Relationship is shown with ◇ (Diamond Symbol)

→ Acc. to definition it is present blw instances But entity instances have no symbol in ER model so we show them blw entity types



Degree of relationship

Types of relationships (on basis of no. of participants)

① Unary Relationship → Degree 1

② Binary Relationship → Degree 2

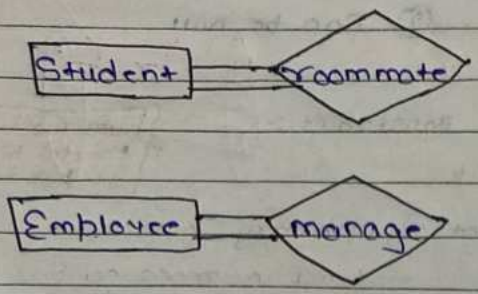
③ Ternary Relationship → Degree 3

⋮

There is no limit on degree of relationships in ER model but binary relationships are mostly used

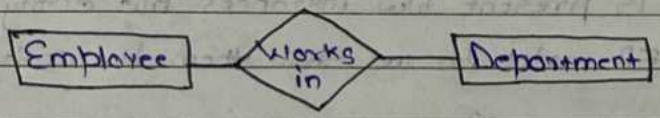
Few Example :

① Unary relationship

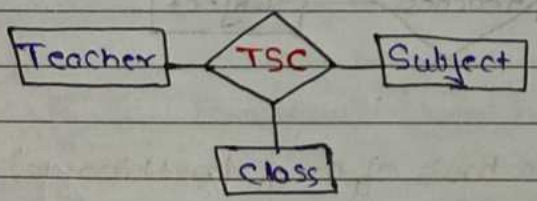


② Binary relationship

Teacher Teaches Subject



③ Ternary relationship



Yaha hume bich wala naam rkhne mai dikkt aaye toh sbka 1st character likh diya uthaker. isse aage bhi ar bde relation mai hume dikkt aayege hi isliye mostly binary use hoga.

⑧ Cardinality of binary relationships

Cardinality

Maximum cardinality
→ one to one
→ one to many
→ many to one
→ many to many

Minimum cardinality
→ Total Participation
→ Partial Participation

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Maximum cardinality : one instance of one entity type is related to maximum of how many instances of other entity type

One to one → Atmost 1 (A to B bhi one to one hona chahiye and B to A bhi one to one hona hai.)

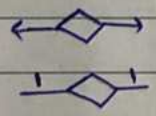
one to many → Any number (0 or more)

many to one → Same as one to many (aap Left to Right dekhiye toh one to many but agar Right to Left dekho toh many to one hoga)

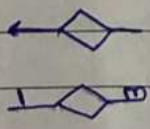
many to many → If one instance of Entity type A is related to any no. of instances of Entity type B & vice-versa.

Symbols

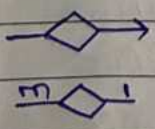
one to one



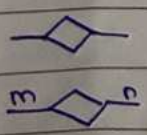
one to many



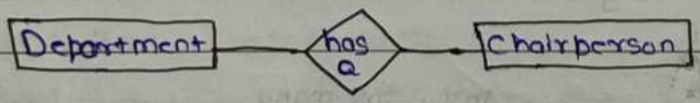
many to one

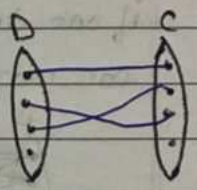


many to many

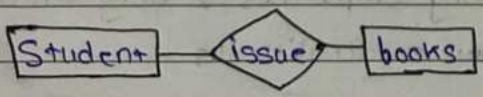


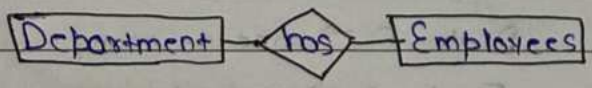
One to one :-

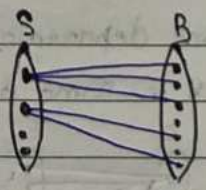




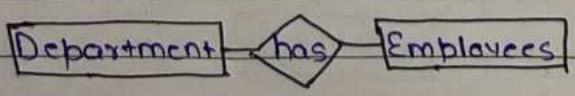
One to many / many to one :-

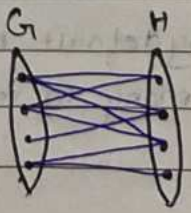






many to many :-





Jab bhi esse sawal aaye toh sbse pehle diagram bana lena and fir dhyan se sawal mei padhna hai kaha se kiis taraf relation pucha hai.

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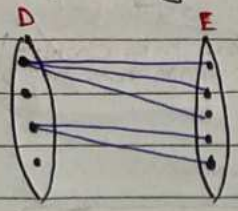
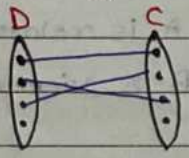
Q- if one department can have many employees but one employee can work only in one department, then cardinality is ?.

Ans-



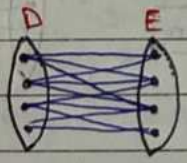
D to E → one to many
E to D → many to one

Q- if one department can have only one chairperson & one chairperson can be assigned to only one department then cardinality is ?.



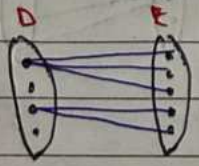
D to C = C to D = one to one

Q- if one department can have many employees & one employee can work in many department, then cardinality is ?.



many to many

Q- if one department can have many employees & many employees work in same department, then cardinality is



D to E → one to many
E to D → many to one

by default maximum cardinality
→ many to many

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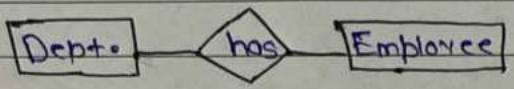
⊗ Minimum Cardinality

→ One instance of entity type A can be related to minimum of how many instances of other entity type B

2 Types

- Total Participation (minimum 1)
- Partial Participation (minimum 0)



Definition of Partial Participation :-

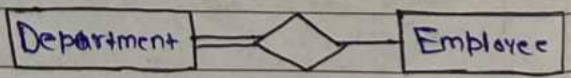
Their may exist some instances of entity type A that are not linked with any instance of entity type B

Definition of Total Participation :-

Their cannot exist any instance of entity type A that is not linked with any instance of entity type B

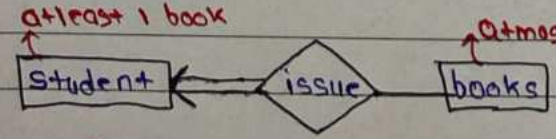
Symbols in ER Model

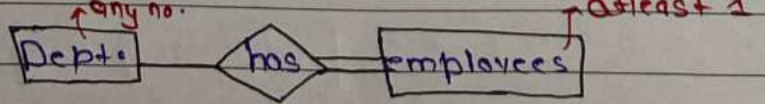
Total Participation : ═══

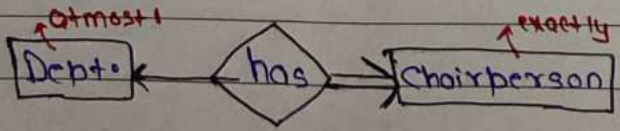


Partial Participation : ———

few Ex:-







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⊗ Relationship b/w Strong and Weak entity types