

Database Management Systems

Data Associations.

An entity is a "thing" or "object" in the real world that is distinguishable from all other objects.
for e.g:- each person in an enterprise is an entity.

→ An entity has a set of properties, and the values for some set of properties may uniquely identify an entity.

for e.g:- Person → {Person-id} → Property of person
→ that uniquely identifies it.

An entity set is a set of entities of the same type that share the same properties, or attributes.

for e.g:- Set of all persons who are customers at a given bank, can be defined as the entity set customer.

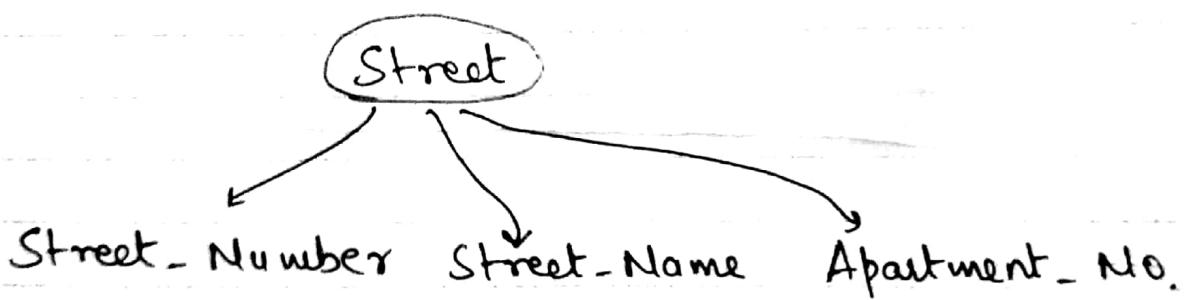
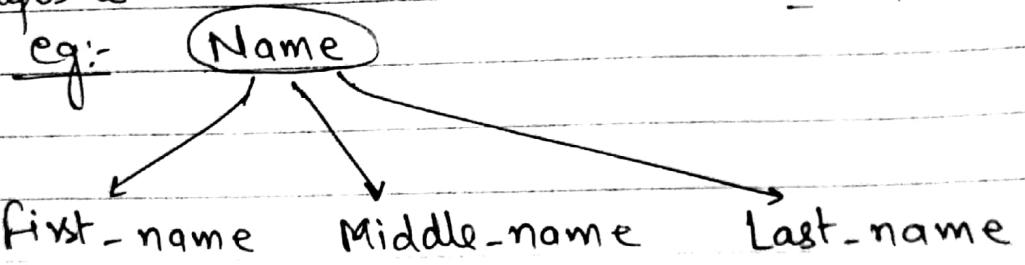
for each attribute, there is a set of permitted values, called -the domain or Value Set, of that attribute

Attribute Types

① Simple and Composite Attributes

Simple = Are not divided into Subparts.
eg:- Unique-id.

Composite = Can be divided into Subparts.



② Single-Valued and Multivalued

Single Valued = Attributes having single value for instance.

eg:- loan-number

Multivalued = Has a set of Values for a Specific entity.

eg:-
phone-number
dependent-name

Value for this type of attribute can be derived from the values of other related attributes or entities.

e.g.: Date-of-birth attribute can be used to derive value of Age.

loans-held = Represents how many loans a customer has from the bank.

Relationship sets:

A relationship is an association among several entities.

e.g.: Relationship that associates Customer "ABC" with loan-number "L1".

A relationship set is a set of relationships of the same type.

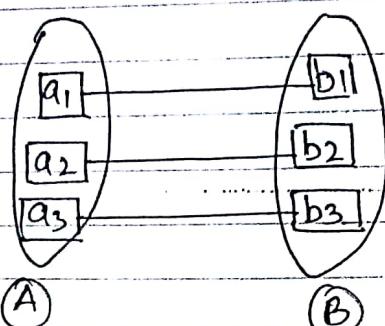
e.g.: Two entity sets Customer and loan. Relationship set "Borrow" denote the association b/w customers and bank loans that the customer have.

Constraints

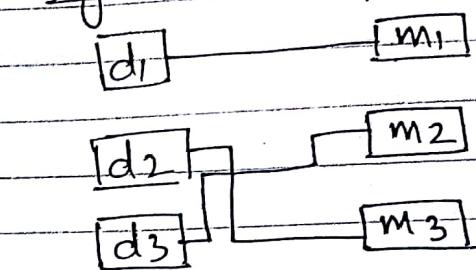
① Mapping Cardinalities

It express the number of entities to which customer (eg) entity can be associated via a relationship set.

One-to-One



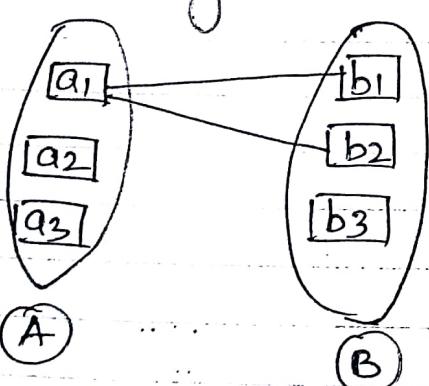
eg:-



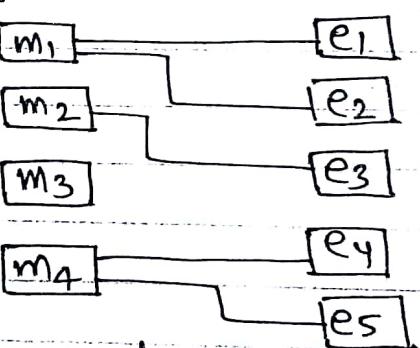
Dept Set

Manager Set

One-to-many



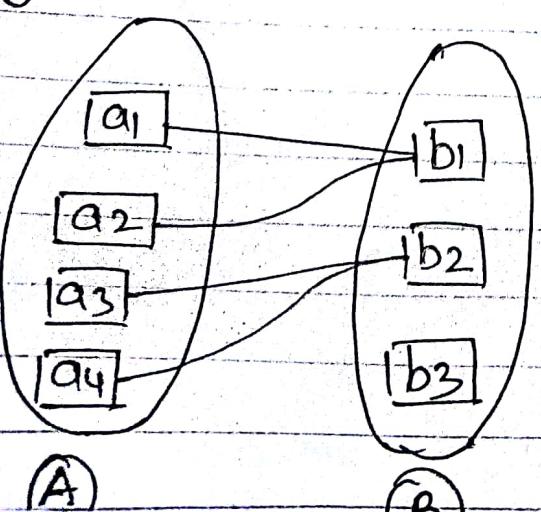
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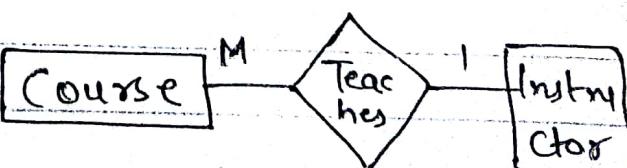
Manager Set

Employee Set

Many-to-One

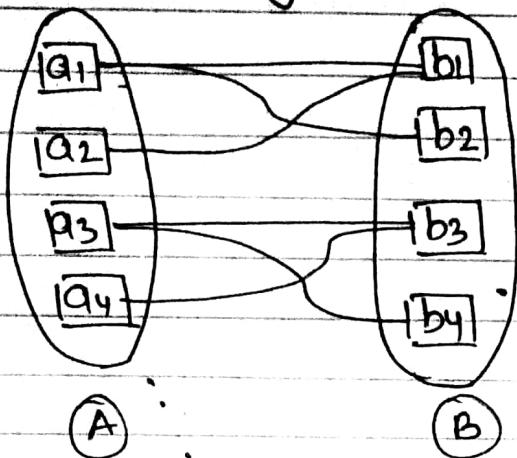


eg:-

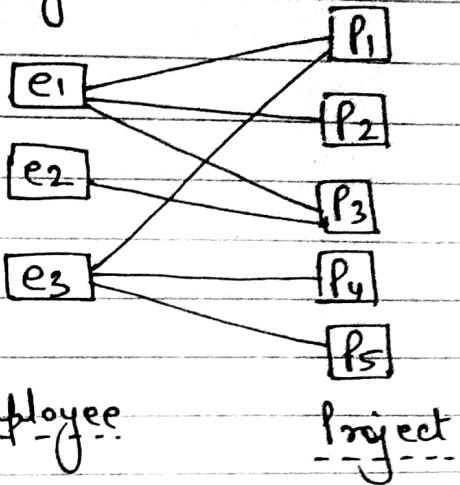


An instructor can teach various courses but a course can be taught only by one instructor.

Many-to-Many



e.g:-



Participation Constraints

Total = If every entity in 'E' participates in at least one relationship in 'R'. ~~at least one~~

Partial = If some entities in 'E' participates in relationships in 'R'.

eg:- Participation of the entity set Student in the relationship set must 'opts' is said to be total because every student enrolled must opt for a course.

Student in relationship set 'represents' is partial, since not every student in a class is a class representative.

Keys :- A Key allows us to identify a set of attributes that suffice to distinguish entities from each other.

Types of Keys

① Superkey is a set of one or more attributes that taken collectively, allow us to identify uniquely an entity in the entity set.

e.g. customer-id → Superkey 1

customer-id + customer-name → Superkey 2.

→ Superkey may contain extraneous attributes.

② Candidate Key :- Superkey for which no subset is a Superkey.

e.g. customer-id

customer-name + customer-street]

both are]

Candidate keys.

③ Primary key is chosen by the database designer as the principal means of identifying entities within an entity set.

④ Alternate key:- Candidate key which is not the primary key is called alternative key.

Secondary Key is an attribute (or combination of attributes) used strictly for data retrieval purpose.

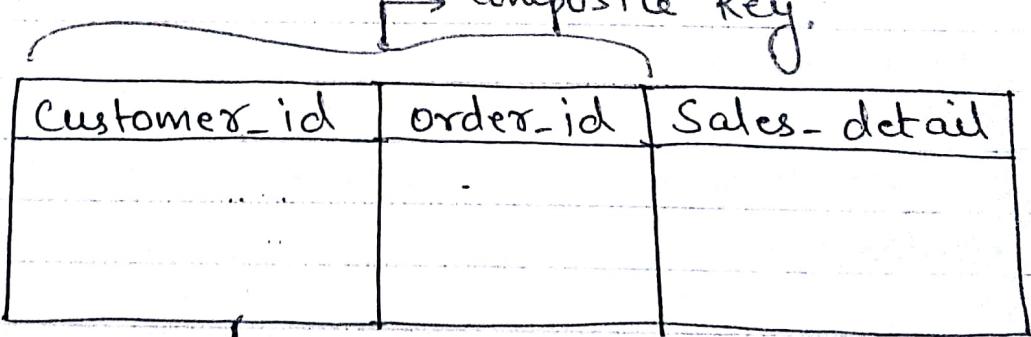
eg- Dept-No in Employee relation.

⑥ Foreign Key is an attribute whose values match the primary key values in the related table.

→ It is a copy of primary key of another table.

⑦ Composite Key is a combination of two or more columns in a table that can be used to uniquely identify each row in the table.

→ Uniqueness is only guaranteed only when the columns are combined.

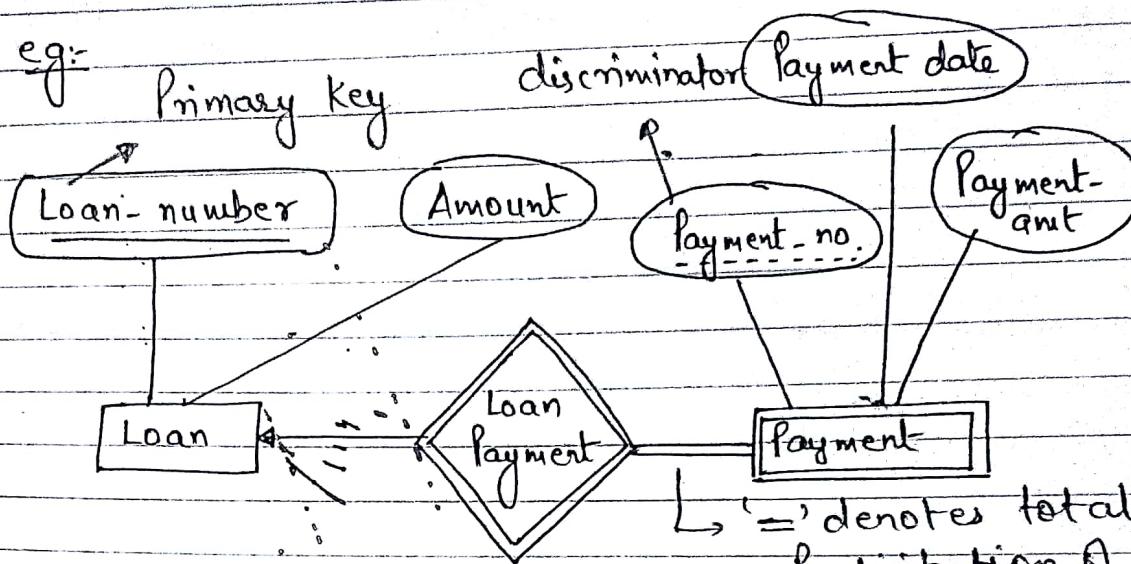
eg:-  → Composite Key.

Customer_id	order_id	Sales-detail

Weak Entities is an entity not having its own primary key, whereas on the other hand, an entity having its own primary key is called as Strong Entity.

Weak entity set is represented by double rectangle.

e.g:-



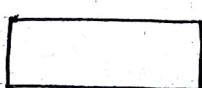
For entity set "Payment", its primary key is
 {loan-number, payment-no.}

E-R Diagram

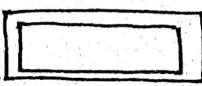
→ E-R diagram can express the overall logical structure of a database graphically.

Notations:

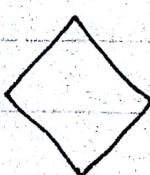
i) Entity type



ii) Weak Entity type



iii) Relationship type



iv) Identifying Relationship type for weak entity set.



v) Attribute



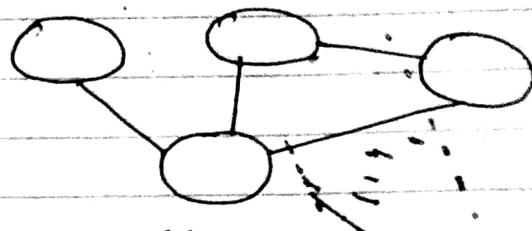
vi) Key Attribute



vii) Multivalued Attribute



viii) Composite Attribute



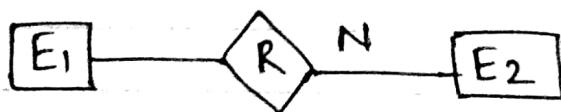
ix) Derived Attribute



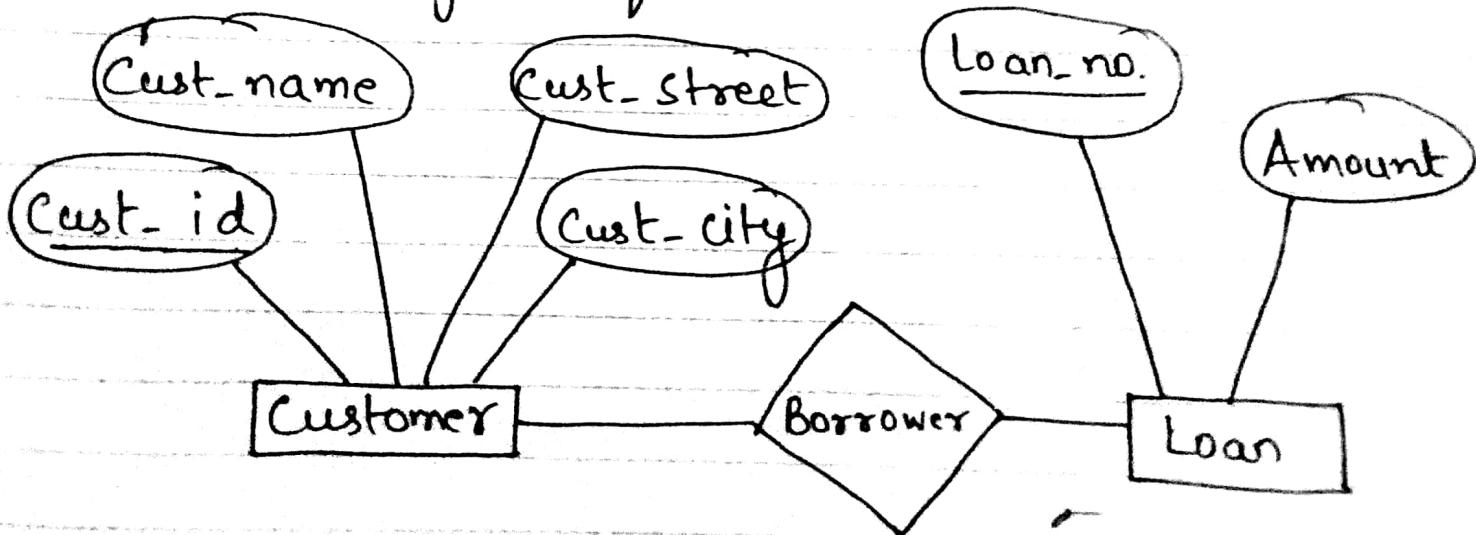
x) Total Participation of E₂ in R



xi) Cardinality Ratio 1:N for E₁:E₂ in R



Eg:- E-R diagram for customer and loans.

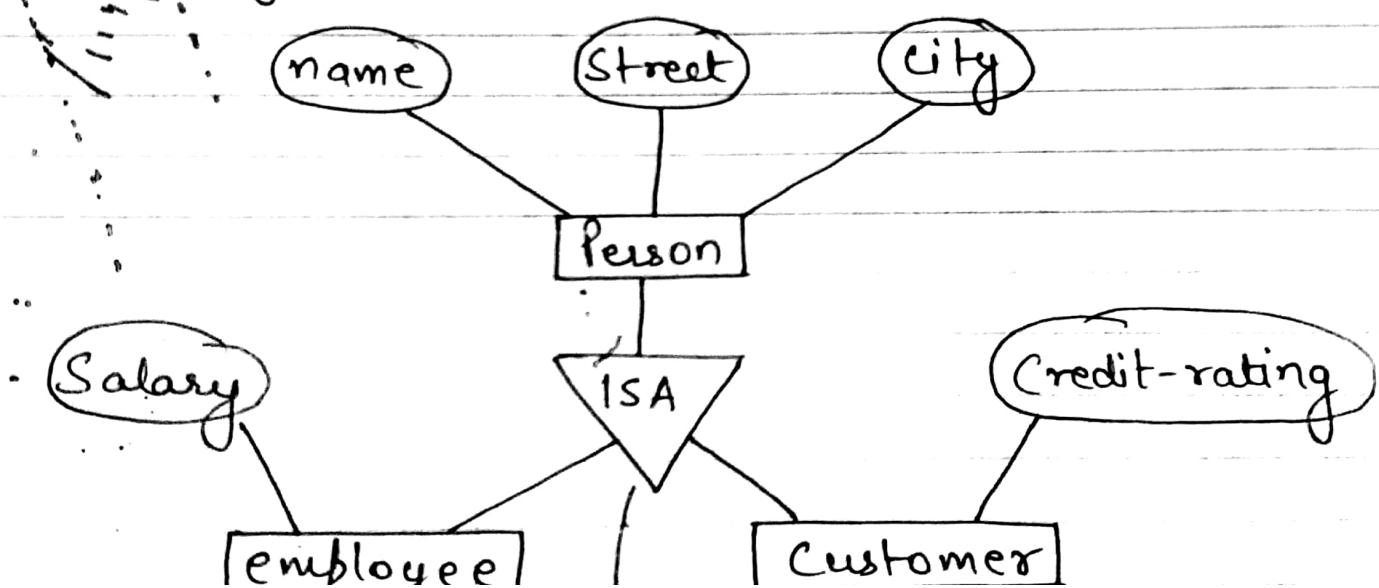


① Specialization

An entity set may include Sub groupings of entities that are distinct in some way from other entities in the set.

Specialization is -the process of identifying Subsets of an entity set (the Super class) that share some distinguishing characteristic.

eg:-

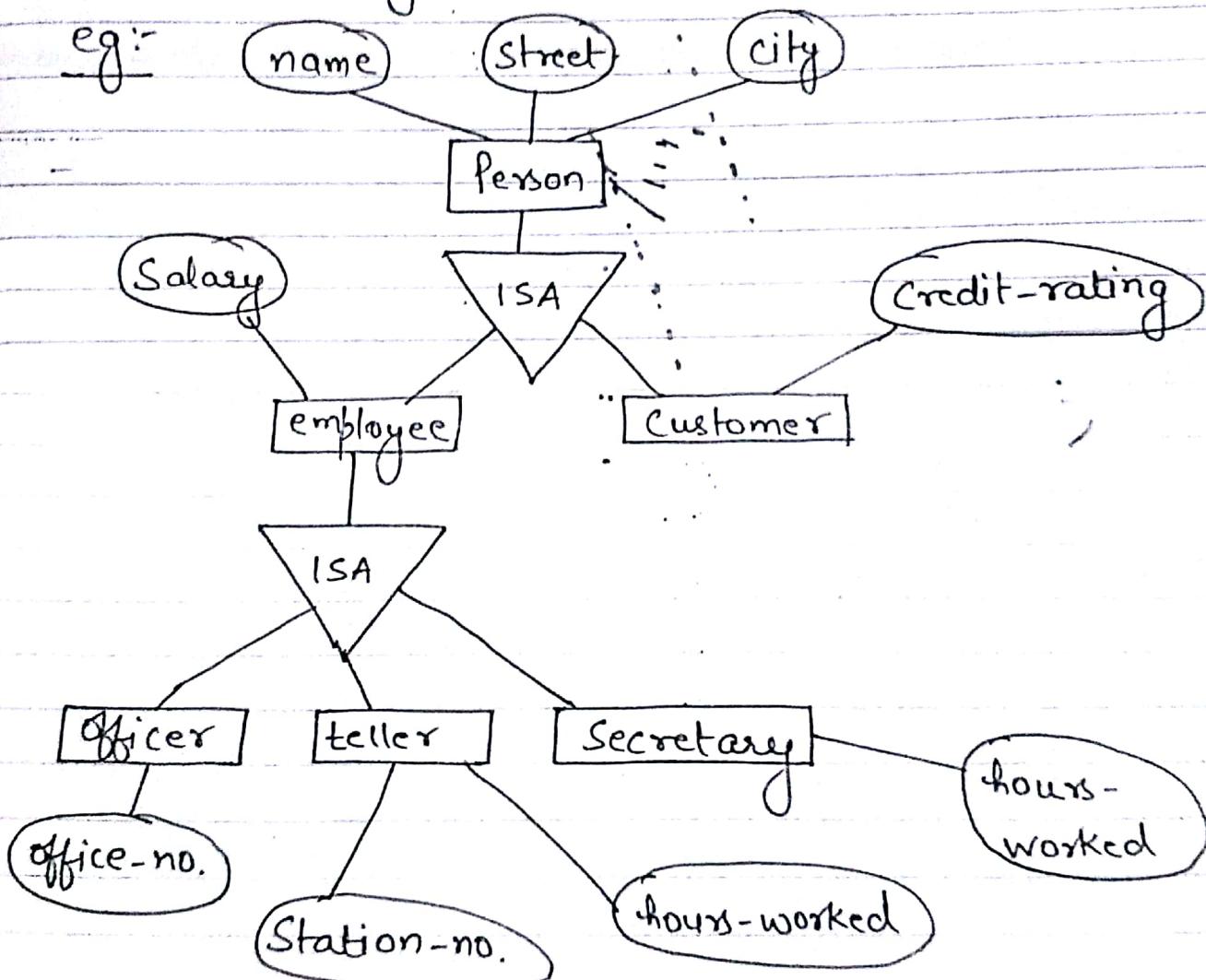


Generalization

↳ Inversion of Specialization.

Generalization proceeds from - the recognition that a no. of entity sets share some common features. On the basis of their commonalities, generalization synthesizes these entity sets into a single, higher level entity set.

e.g:-



Specialization and Generalization.

③ Attribute Inheritance.

Attributes of the higher-level entity sets are said to be inherited by the lower level entity sets.

For eg:- Customer and employee inherit the attributes of person.

Customer is described by name, street, city and additional customer_id attribute.

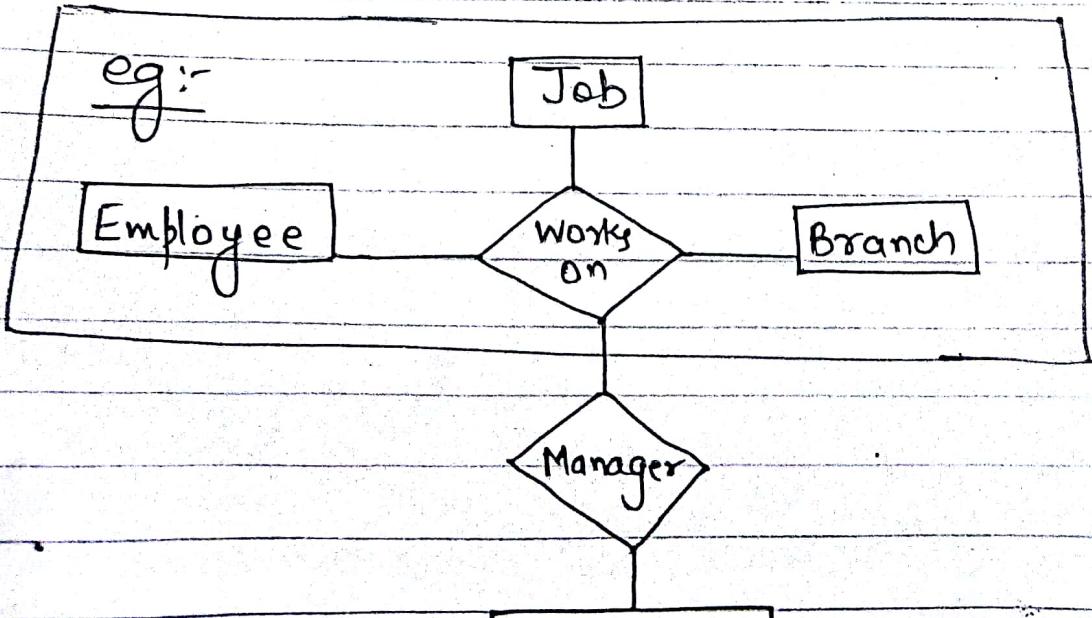
Employee is described by name, street, city and addition emp_id attribute.

④ Aggregation.

One limitation of the E-R model is that it cannot express relationship among relationships.

Aggregation is an abstraction through which relationships are treated as higher-level entities.

eg:-



'Treated as higher level entity set.'

Objectives Relationships

Translating E-R Model into Relational Model.

