Lec 5

ER

Date No

(*) Elmasri Navathe ER diagrams

Entity - Relationship (ER) Model

1. Requirements gathering
↓
2. Conceptual db design
↓
3. high level data model (ER) created

ER Model
Constructs
↓
Entities | Relationships

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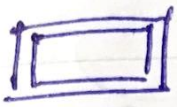
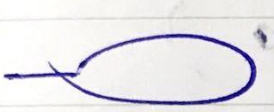
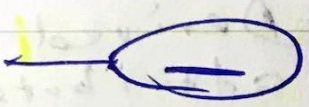
Entity

 Weak entity

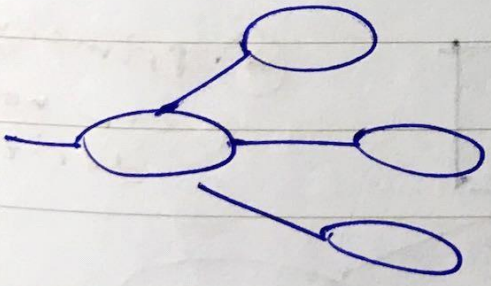
Relationship

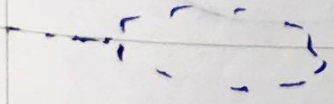
Identifying relationship

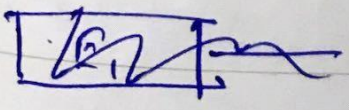
 Attribute

 key attribute.

Multivalued attribute

 Composite attribute

 derived



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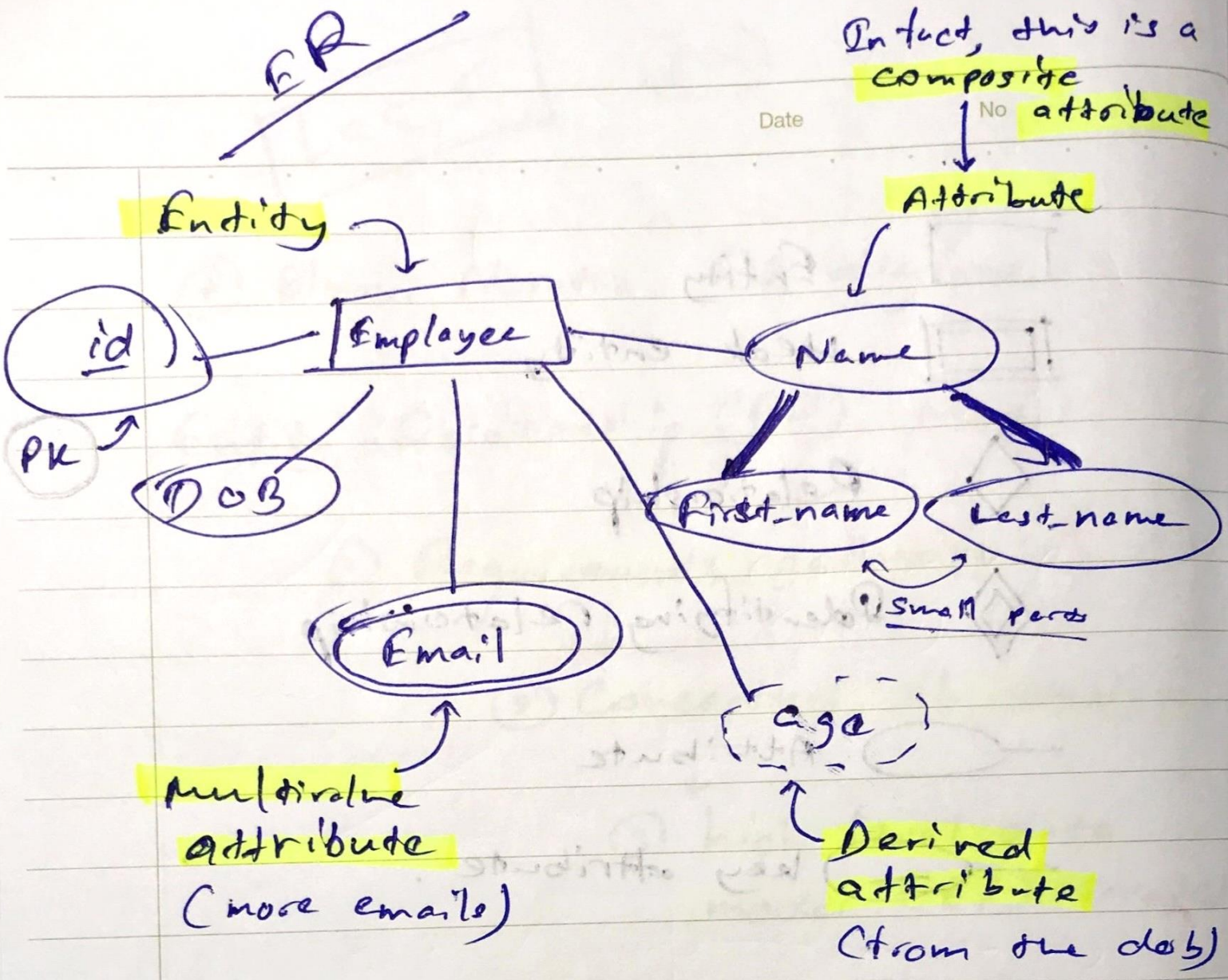
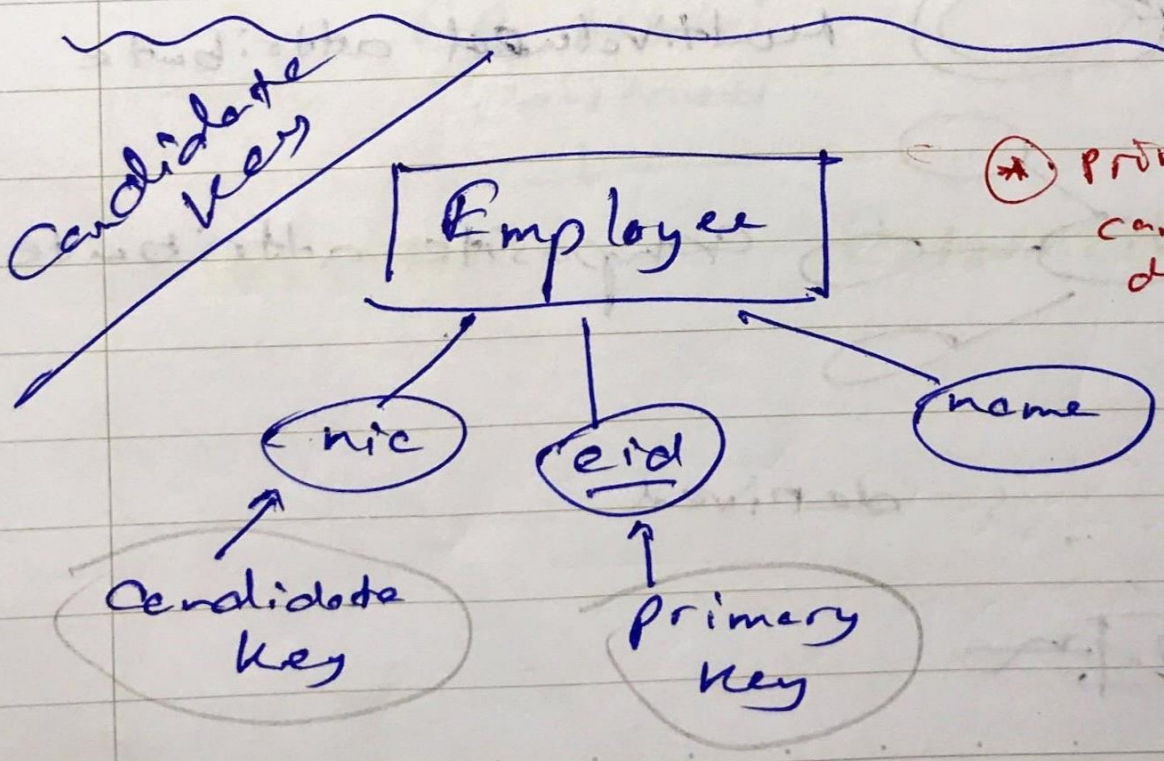
ER



Candidate Keys



* primary key can not be derived.

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Composite key

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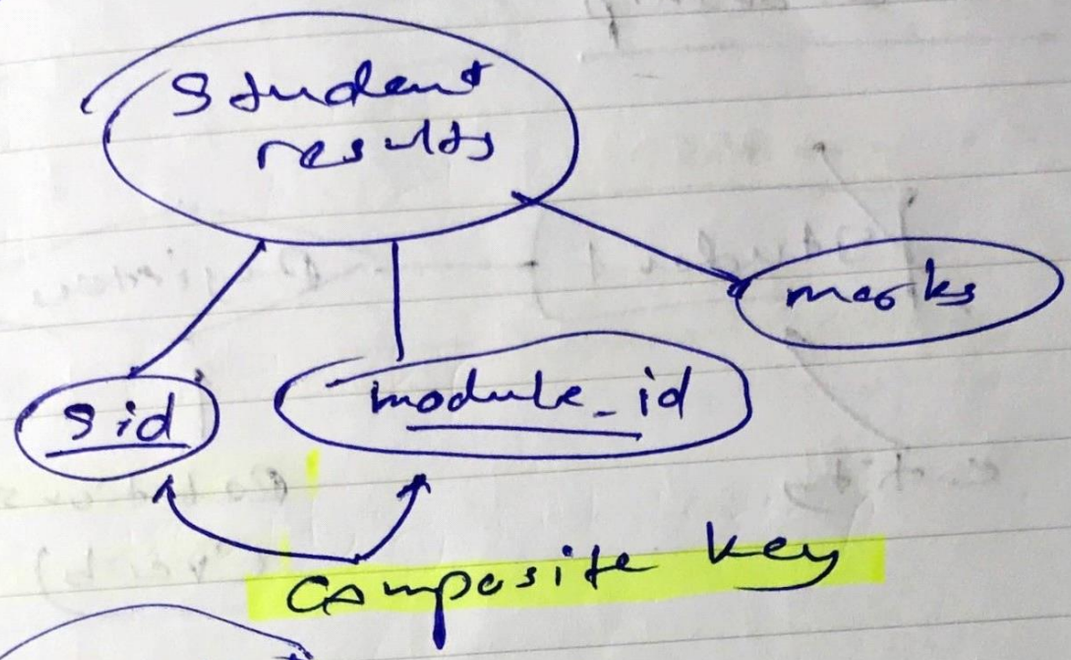

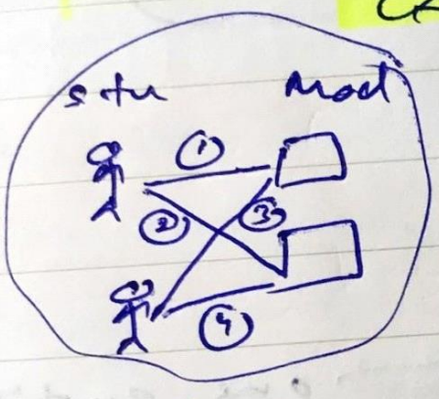

Super key

SID → Unique, Minimal } primary key

SID + Name → Unique, not minimal } super key

SID + Mod_id → ?

(primary key)

Composite key

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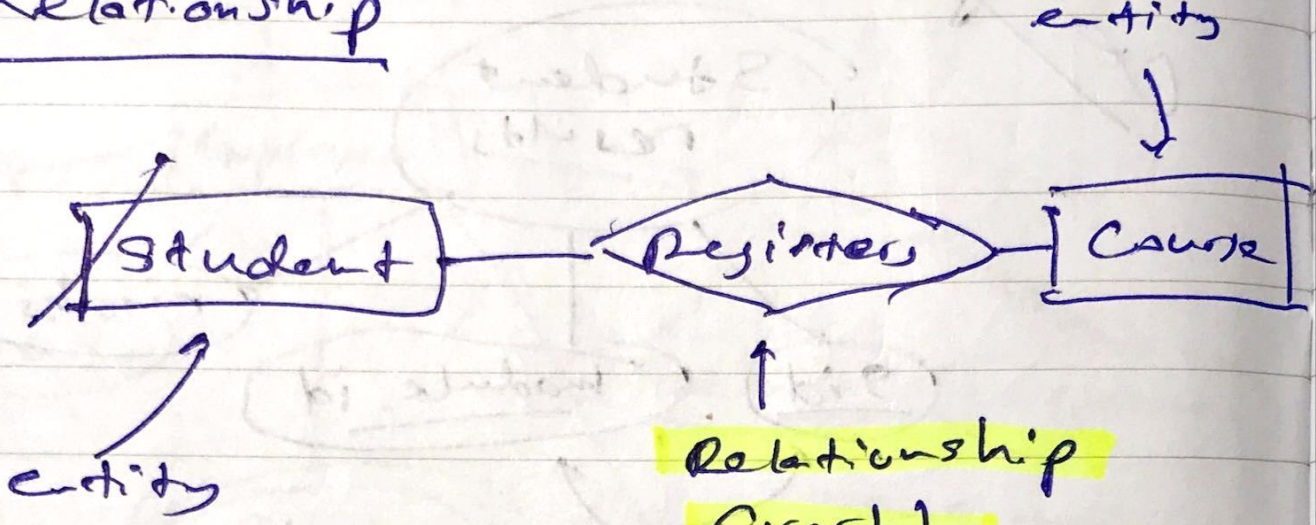
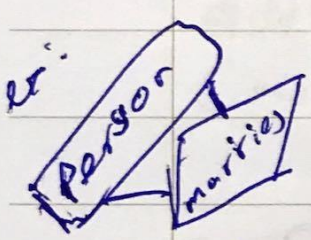
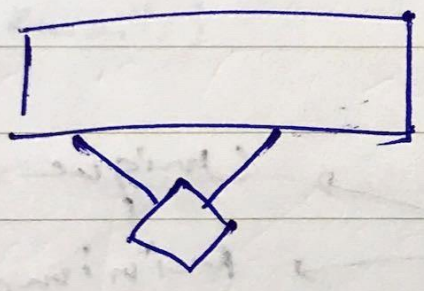
Relationship



degree

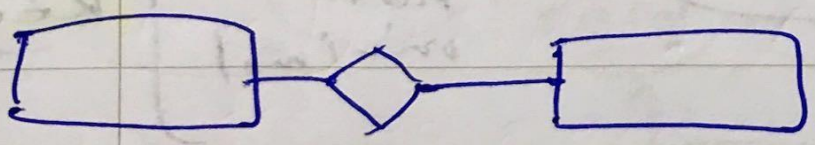




one entity is connected

degree is 1

Unary / recursive relationship



degree = 2

binary relationship

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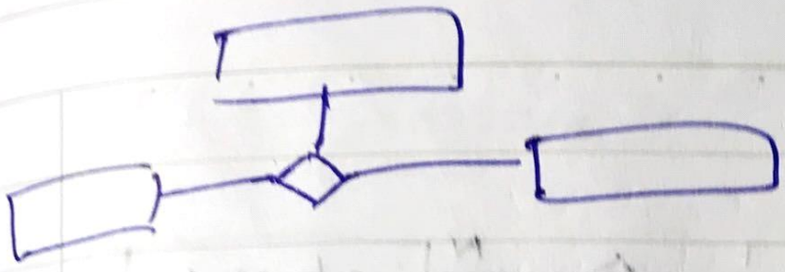


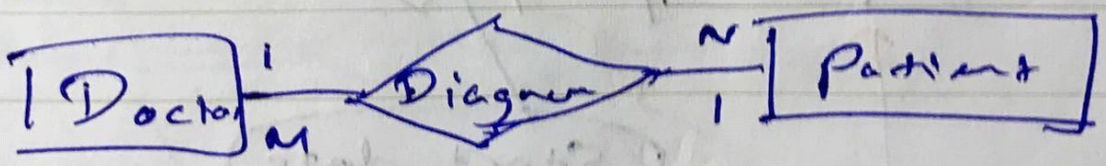
degree = 3
↓
Ternary relationship

degree = 4 ⟶ Quarternary relationship

Cardinality

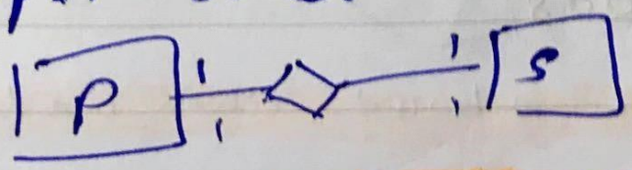
1. One-to-one
2. One-to-many
3. Many-to-one
4. Many-to-many

Doctor-Patient:



∴ one-to-many or many-to-many

Principal-School



∴ one-to-one

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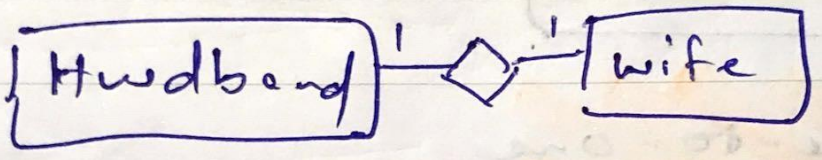
mother-child

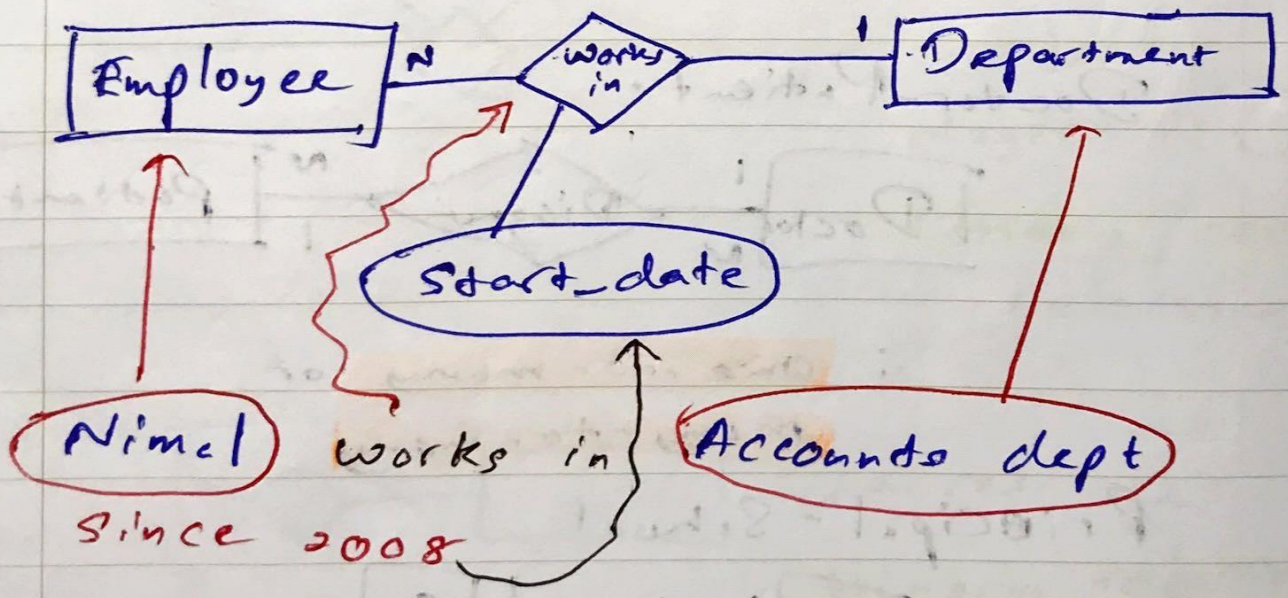
∴ one-to-many

Husdband-wife



∴ one-to-one

Descriptive Attribute



> Information about the relationship

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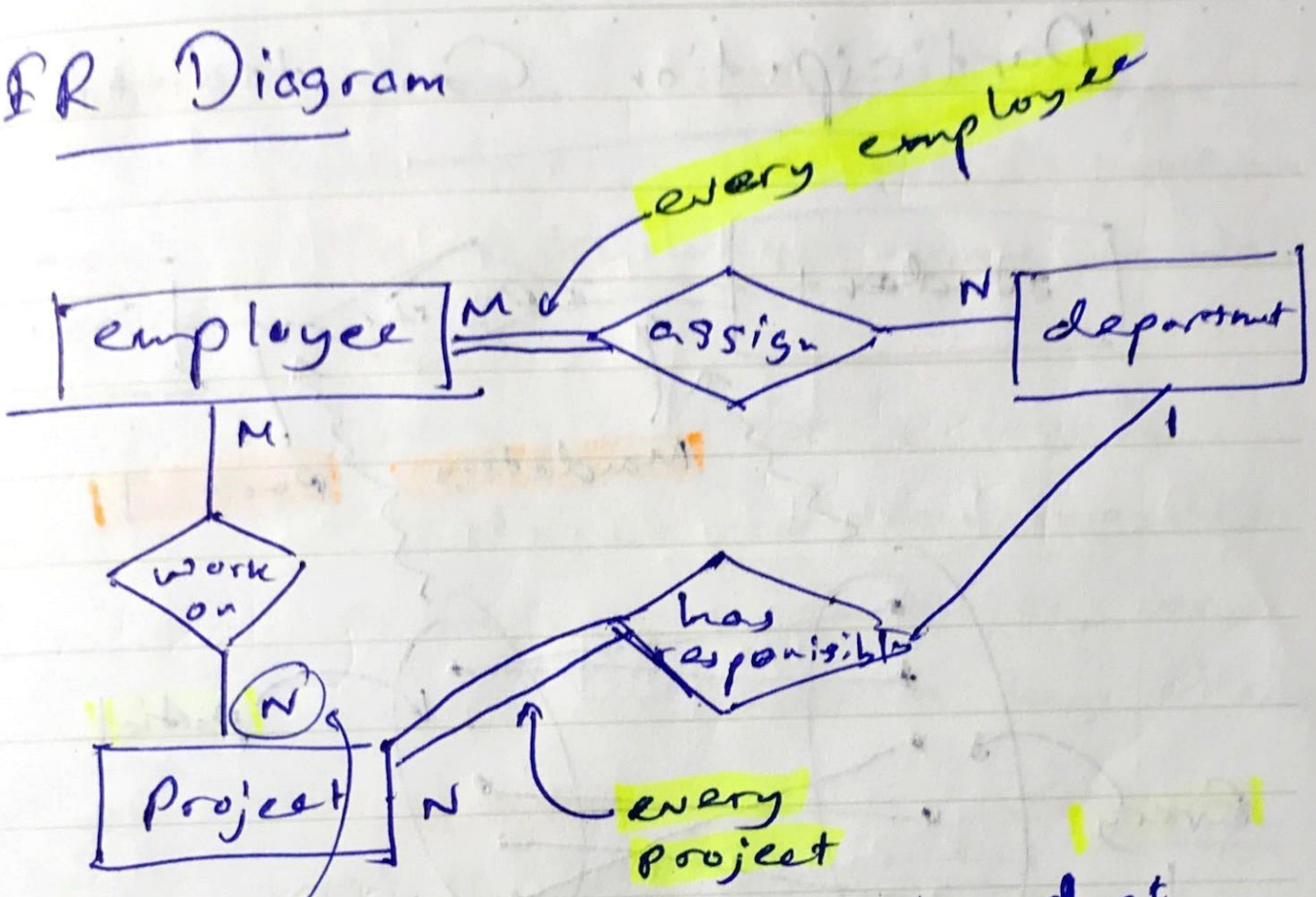
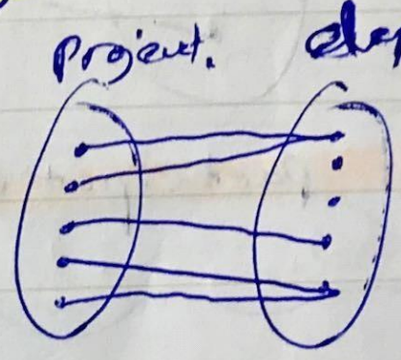
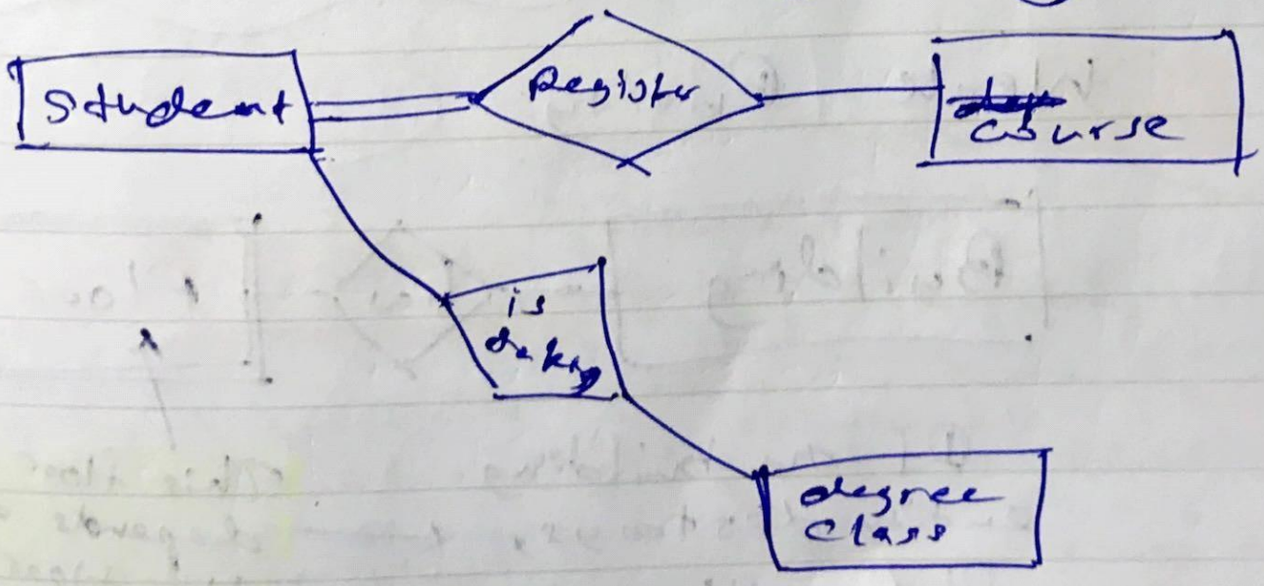
ER Diagram







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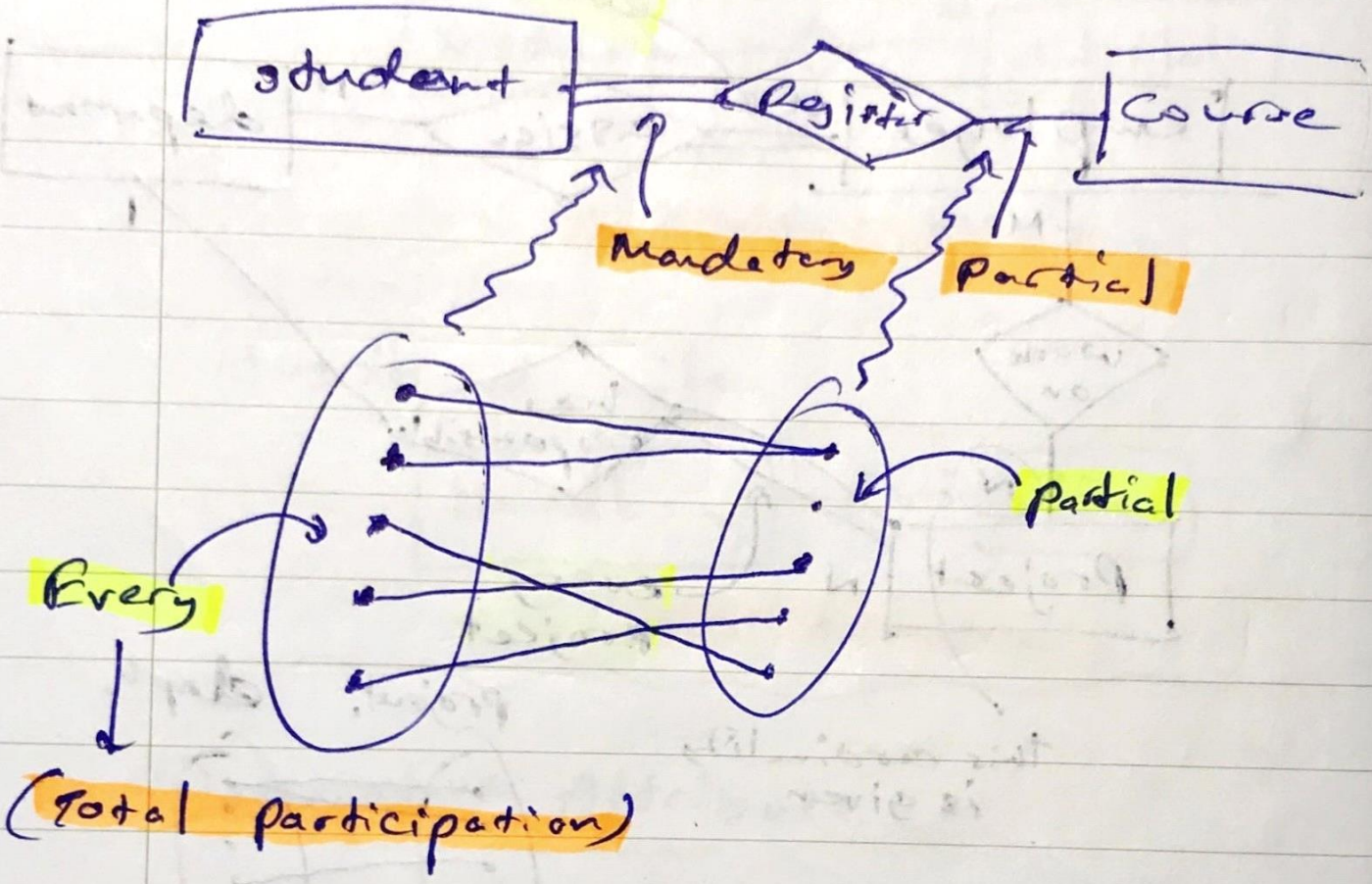
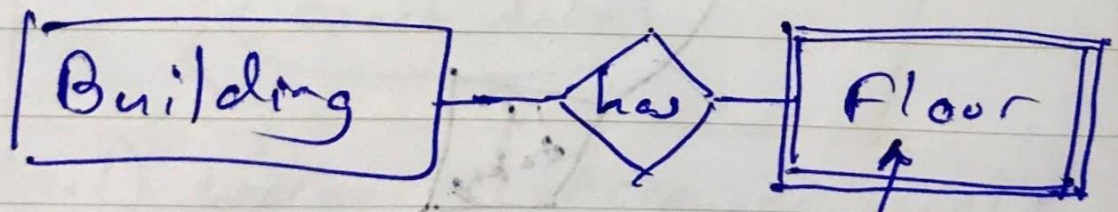
Participation Constraints



Weak Entity



If the building entity destroys, floor will automatically destroy.

This floor depends on the floor

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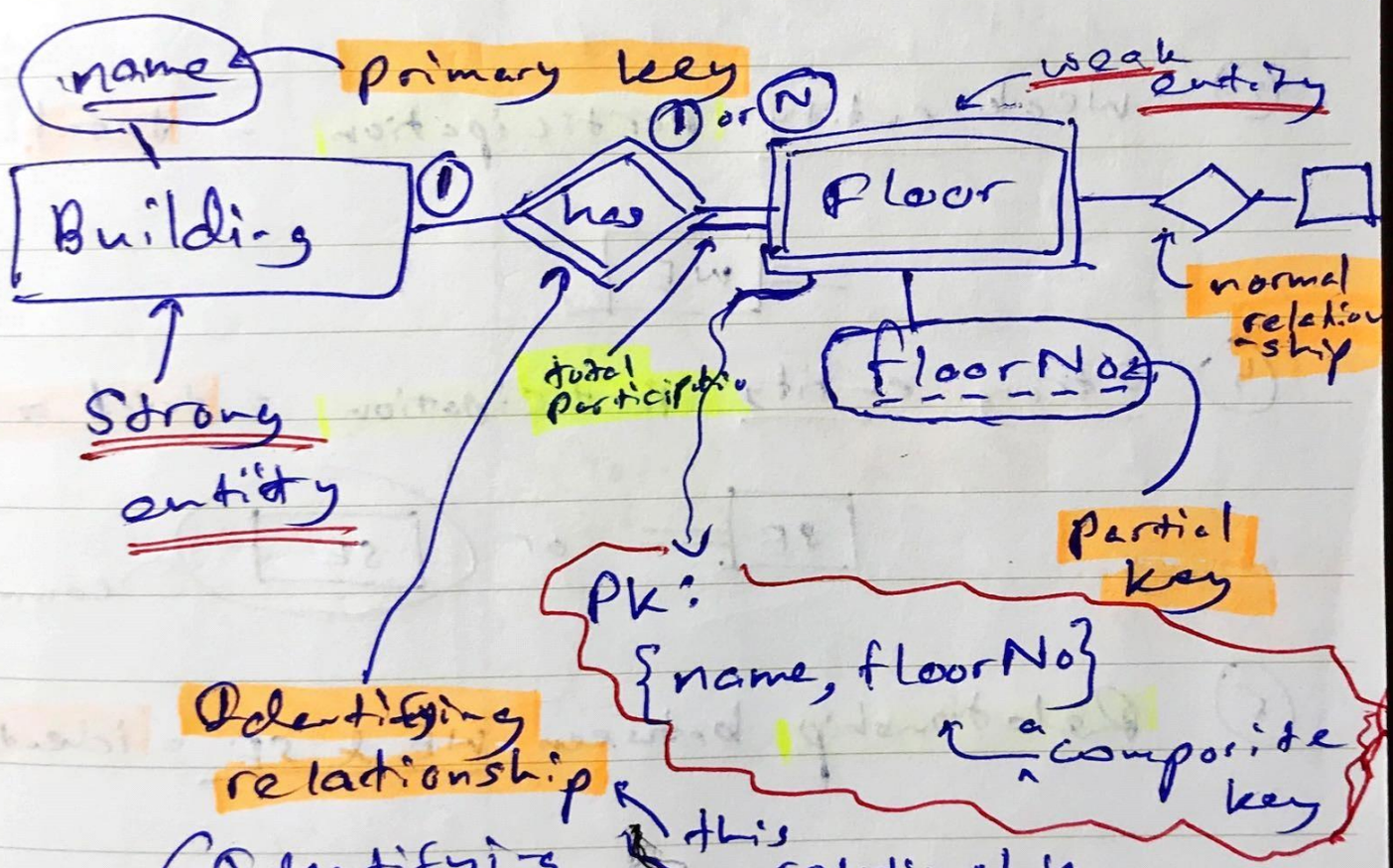
floor it doesn't have ~~an~~ a unique identifier, we have to mention the building name as well.

~~That's~~ ~~it~~

Every time for a weak entity as ~~it~~ they haven't a unique ~~a~~ identifier, we have to add a key attribute



These notations :— Chen's notations

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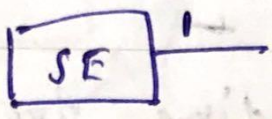
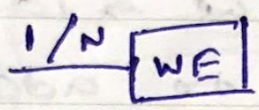
Summary - weak entity

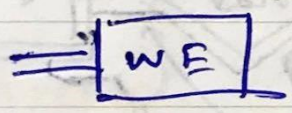
① Strong entity cardinality = 1



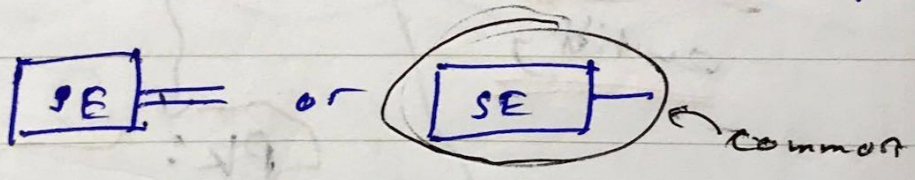
② Weak entity cardinality = 1 or N



③ Weak entity participation = total



④ Strong entity participation = total or partial



⑤ Relationship between WE & SE = identifying

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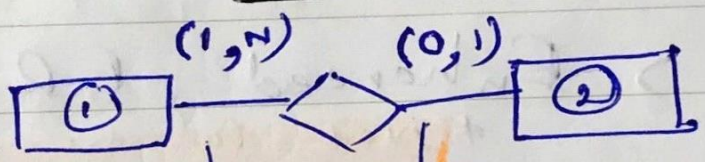
Min - Max Notation

Min - Participation Constraint → Total → 1
→ Partial → 0

Max - Cardinality (1 / N)

Chen's Notation

Min - Max Notation



(1, N)

Participation (Total) of 1

Cardinality of 2

(0, 1)

Cardinality of 1

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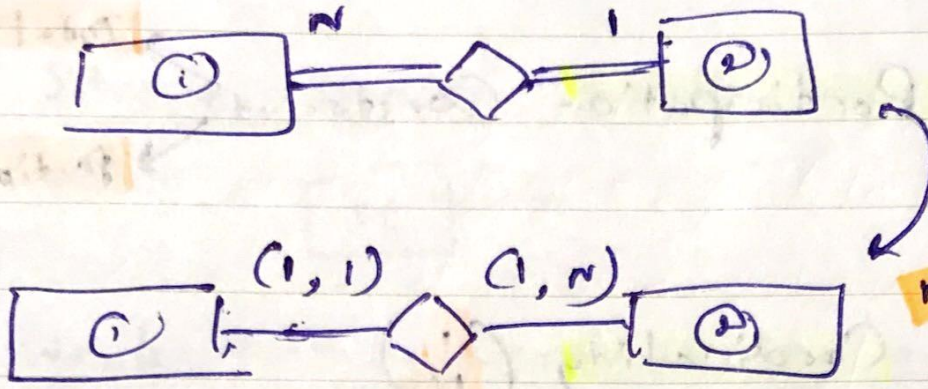
ex:

Chen's

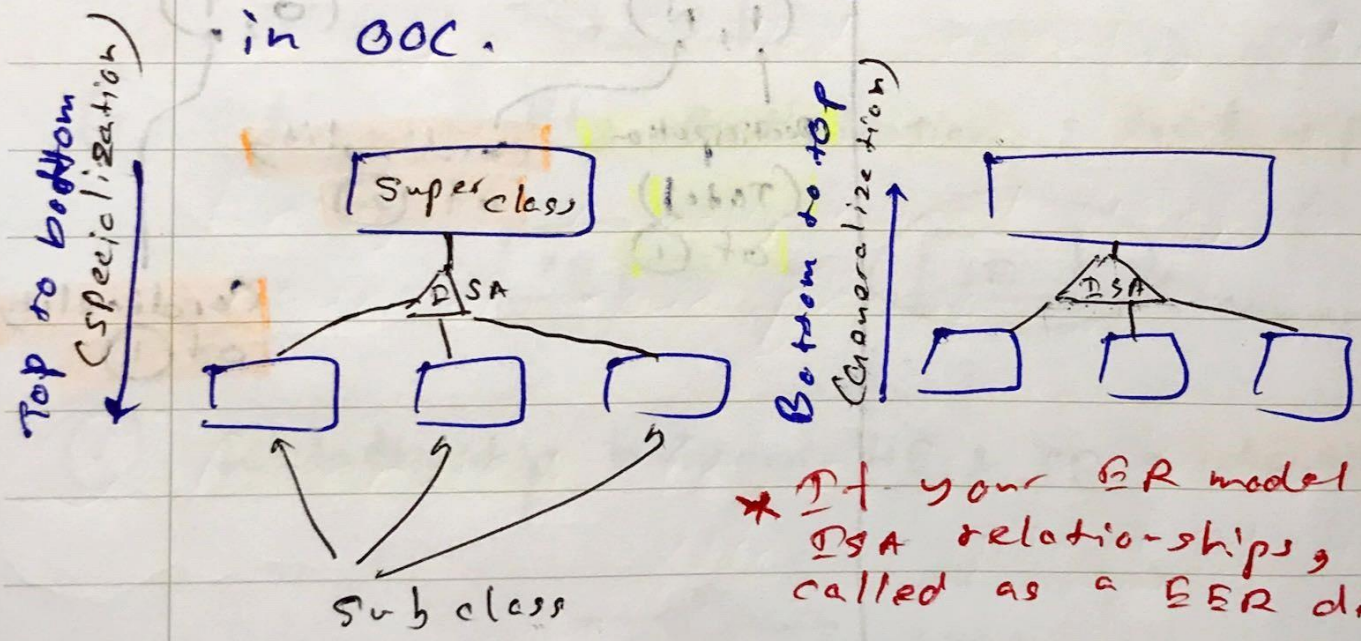


Min - Max

> Enhanced ER Model (ISA)

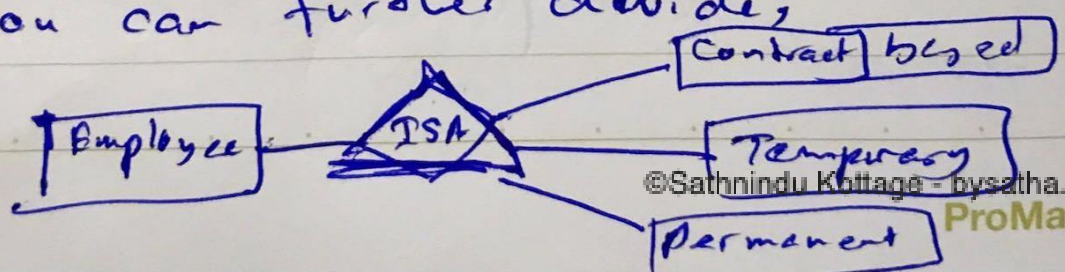
* Not for the exams (Y2S1)

This is * something like inheritance in OOC.



* If your ER model has ISA relationships, it called as a EER diagram.

ex: You can further divide;



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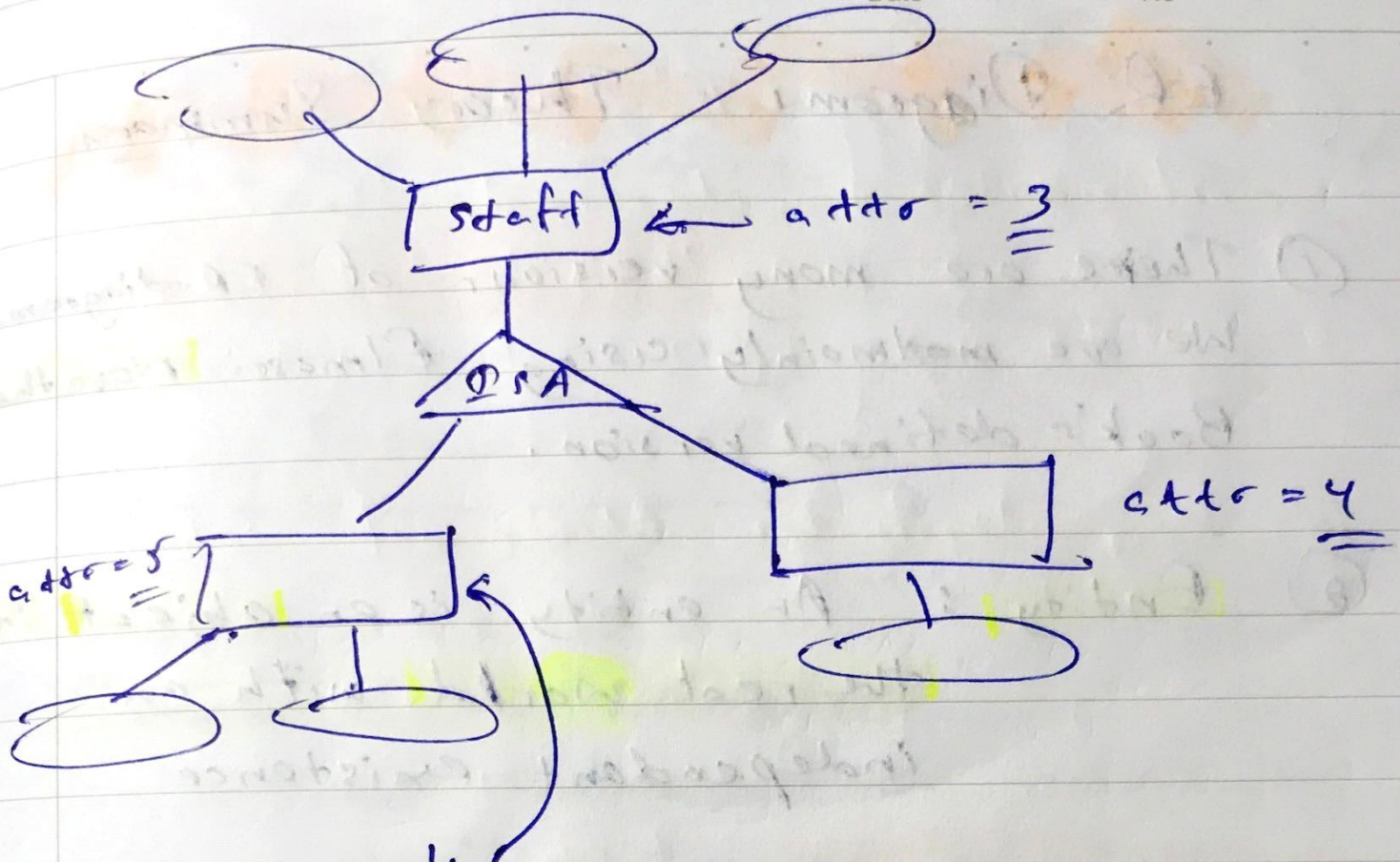

this subclass automatically inherit all the attributes in the super class.

∴ all attributes = 3 + 2
= 5

other notation versions

UML, min-max, ..

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E.R Diagrams - Theory Summary

① There are many versions of ER-diagrams, We are ~~mat~~ mainly using Elmasri Navathe Book's defined version.

② **Entity** : An entity is an object in the real world with an independent existence

Entity Set } : A collection of similar entities is called an entity set.

Entity is normally named using a 'noun' or 'noun phrase'.

③ **Attribute** : An entity is described using a set of attributes

> Graphically oval

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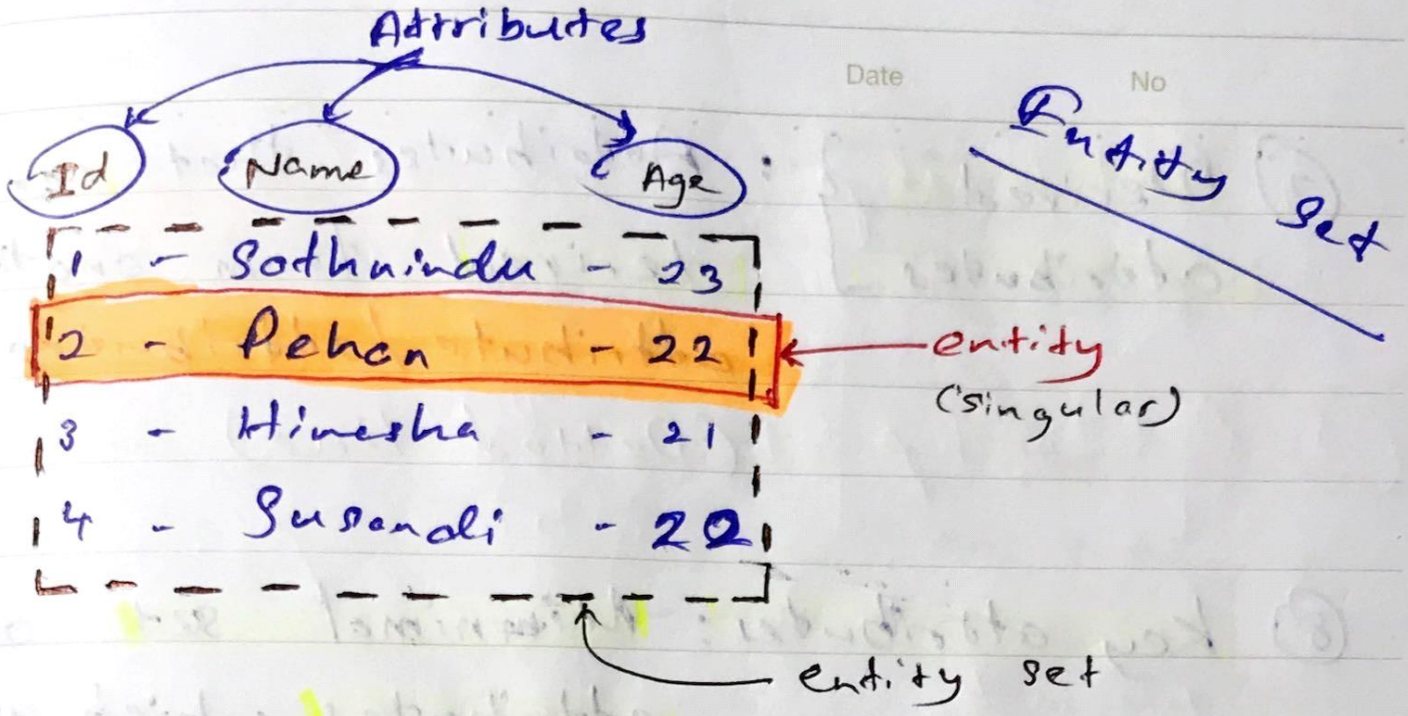

(4) **Domain of an Attribute:**

The domain of an attribute specifies the set of possible values that the attribute can have. (data type)

(5) **Composite attribute:** can be divided into smaller sub-parts.

(6) **Multi valued attributes:** Attributes containing multiple values are called multivalued attributes.

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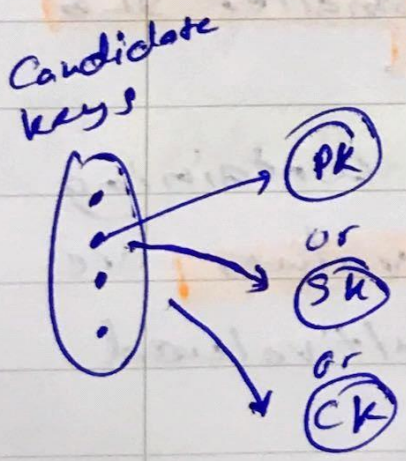
(7) Derived attributes } : Attributes that can be derived from another attribute / attributes.
(Dotted line)

(8) Key attributes: Minimal set of attributes which uniquely identify an ~~et~~ entity in the entity list.

(9) Primary key: There can be multiple key attributes called Candidate keys in a single entity.

↓

A single candidate key is <u>designated</u> as the primary key.



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key attribute → unique

derived or always can be changed → ex: Timestamp → Not a candidate key

Static → ex: email → Candidate key → Primary key, ~~super key~~, Composite key

Super key → > Unique
> not the minimal

(10) Composite key: A group of attributes make up the key.

(11) Super key: Any other set of attributes that uniquely identify a tuple is called the super key of a relation.

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(12) **Relationship:** is an **association** among two or more entities.

(13) **Relationship set:** **Collection** of **similar** relationships.

Normally a relationship is named using a **'verb'** or **'verb group'**

(14) **Degree of a Relationship** : degree of a relationship is the **number of** participating **entities** in the relationship.

- Binary (2)
- Ternary (3)
- Quaternary (4)

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(15) Cardinality ratio : for a binary relationship specifies the number of relationship instances that an entity can participate in.

(16) Descriptive ~~Det~~ Attribute : Used to record information about the relationship rather than any of the participating entities.

(17) Participating ~~criteria~~ constraint : Specifies whether the existence of an entity depends on its being related to another entity via the relationship type.

(18) Weak entity :
> Some entities can't exist on its own.
> exist depend on another entity
> It inherits the part of the PK from the entity related.

* Entity types without any key attributes is called weak entity types

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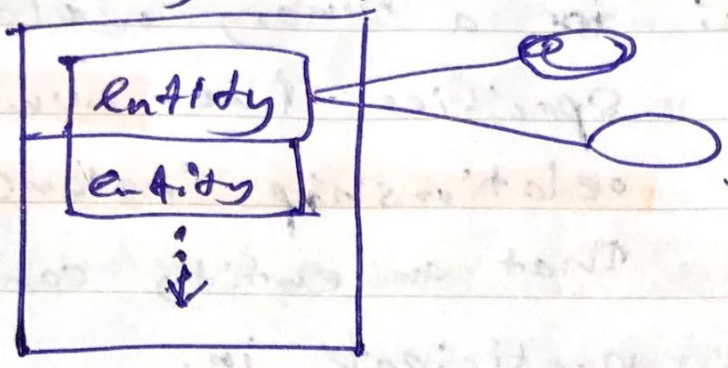
entity set / entity type



no key attribute (only partial key ~~Attr~~)

∴ weak entity type / set

(19) Partial key : The attribute in the weak entity participating in the key

(20) Identifying relationship } : The owner entity and the weak entity participates in an identifying relationship.

(21) ~~Rela~~ Recursive relationship } : Entities participating in a relationship need to be distinct.

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(22) role

Each entity in the relationship play a role in the relationship. It is ~~called~~ recommended to state the role in recursive relationships

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