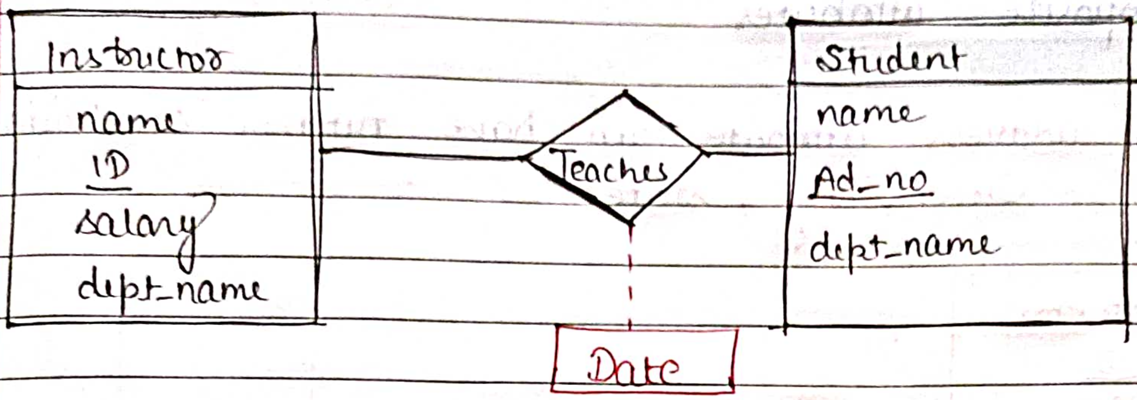
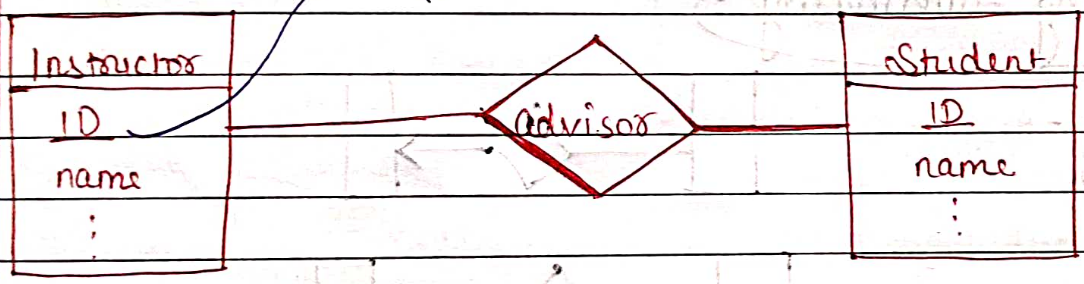
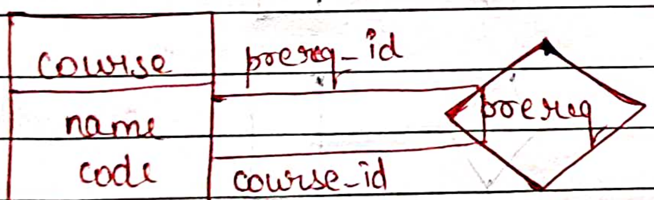



ER model.

underline means ID is a primary key.



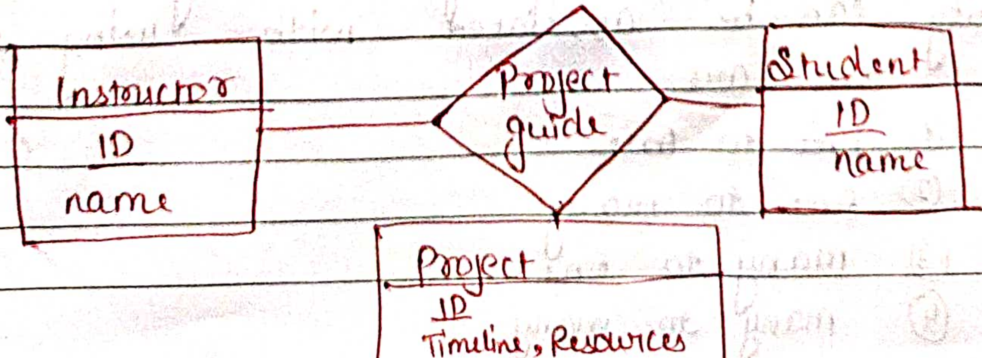

Relation between two entity sets.




Relationship between same entity set.

generally a relationship is between two entity sets. But in some cases it can connect more than two entity sets as well.

eg.



VAISHALI

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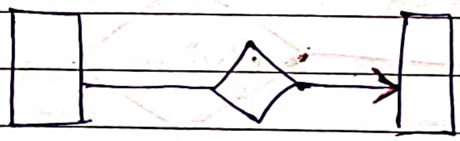
## Composite attributes

eg. address attribute can have further subdivisions street, city, state.

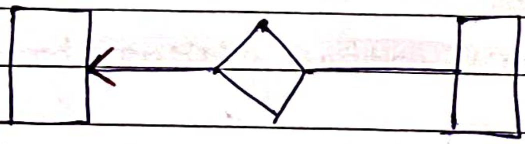
Instructor
ID
name
address
  street
  city
  state

## Mapping Cardinality :-

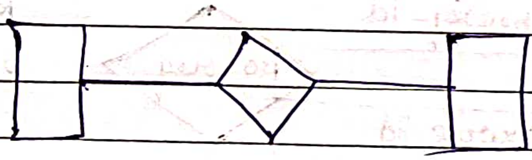
Many - one



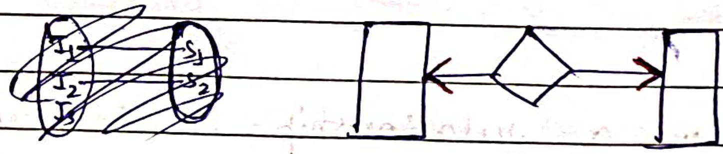
One - many



many - many



One - One



Definition

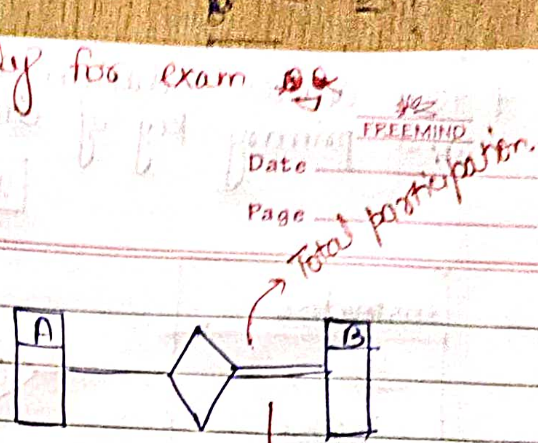
Express the cardinality of number of entities an entity can be associated with using relationship sets. They are

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

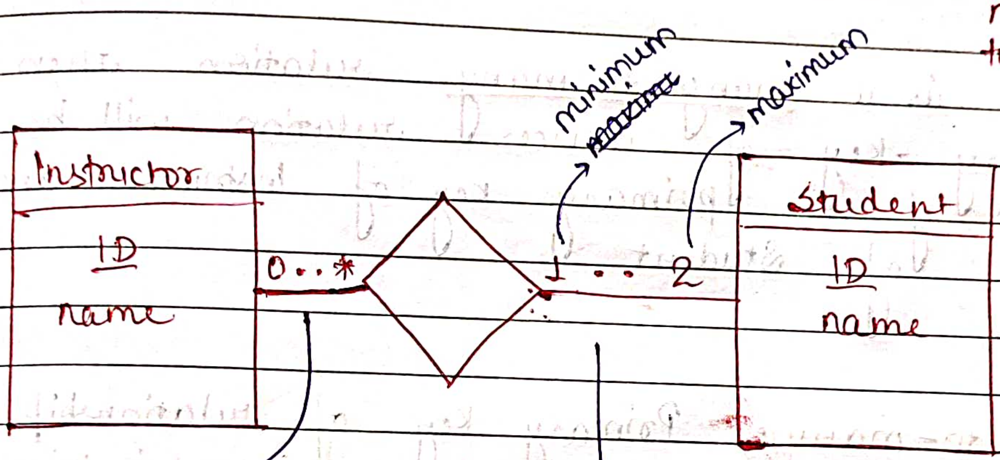
* Focus on Binary relationships only for exam



Total participation: (onto)




This means every one in B must be related to someone in A.

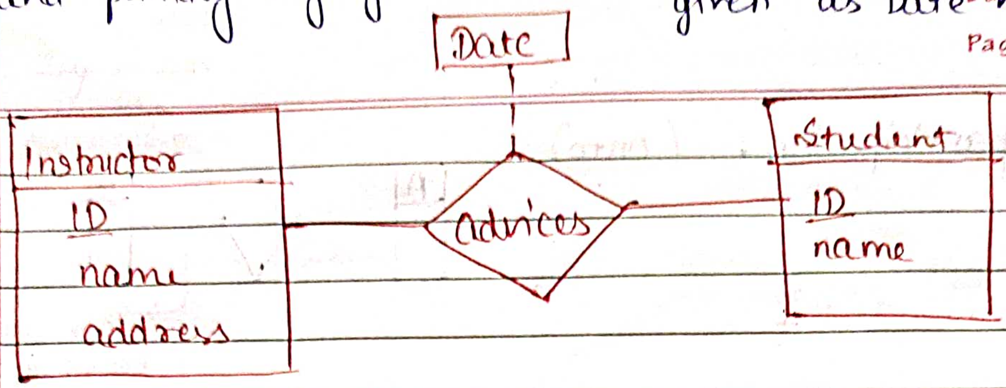



This means there can be an instructor not connected to any student and * means one instructor can be connected to any ~~many student~~ no. of student.

This means every student should be connected ~~to at least~~ one instructor and to at most two instructor

How to pick primary key for relationship tables.

* Here advices relation has attributes Primary key of Instructor and primary key of Student and other attributes which are given as Date here.



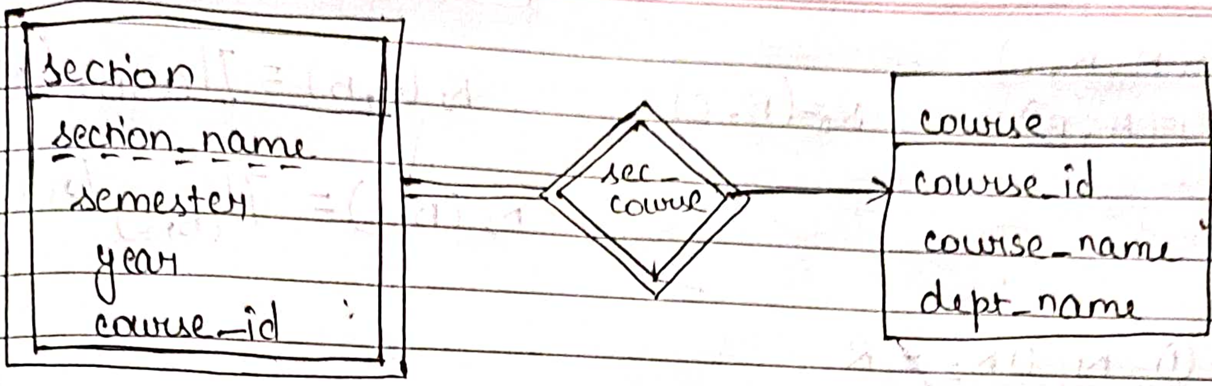

If it is a many to many relation then the primary key of advices relation will be union of primary key of Instructor and that of Student

Many-to-many: Primary key of relationship set is union of primary keys of instructor and student and other attributes.

One to many: (One instructor to many student) Student.ID will be the primary key.

One to many
Many to one relationship: The primary key of many side ~~will be~~ suffices as primary key of relationship set.

One to one relationship: Any primary key of either side can be used as primary key of relationship set.




weak entity set :

Redundant attributes
And How to improve the design of DB to save space?

NORMALISATION

DECOMPOSITION

LOSSLESS DECOMPOSITION

functionally dependent.
(city → state)

Instructor(ID, name, salary, city, state, country, dept name, building)
Suppose we decompose instructor into

Instructor1 ( ID, name, salary, dept-name, building, city)
Instructor2 (city, state, country)

Instructor1 $\bowtie_{city}$ Instructor 2 = Instructor ⇒ Lossless

Lossy decomposition : If natural join does not give original relation, Then Lossy.

$r$

| A | B | C |
|---|---|---|
| 1 | 2 | 3 |
| x | y | z |

Date

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$R = (A, B, C)$

$R_1 = (A, B)$ . $R_2 = (B, C)$ . $R_1(A, B) = \Pi_{(A,B)}(r)$

$R_2(B, C) = \Pi_{(B,C)}(r)$

① $R_1 \cup R_2 = R$

Functional Dependency * $f(x_1) = y_1$ if $y_1$ is functionally dependent on $x_1$

$\boxed{\text{Then } f(x_1) \neq y_2 \quad \text{if } y_1 \neq y_2}$

Lossy decomposition

let $R(A, B, C)$ be a relation schema $A, B, C$ are attribute names

$r$ denotes a particular instance of ~~relation~~ schema $R(A, B, C)$ containing specific values.

let $R_1(A, B)$ $R_2(B, C)$ be the decomposition of $R(A, B, C)$

$$\Pi_{A,B}(r) \bowtie \Pi_{B,C}(r) = r$$

We say that the decomposition is lossless, if there is no loss of information.

Decomposition is lossy if,

$$r \subset \Pi_{A,B}(r) \bowtie \Pi_{B,C}(r)$$

Functional dependendcy :

let R be a relationship schema

$\alpha \subseteq R$ , $\beta \subseteq R$

We say a functional dependancy $\alpha \to \beta$ holds in R iff for any tuples in r(R) if the values of attributes $\alpha$ match for those tuples, then the values of attributes $\beta$ will also match for those tuples.

$$\boxed{t_1[\alpha] = t_2[\alpha] \Rightarrow t_1[\beta] = t_2[\beta]}$$

★ $A \to B$ , $B \to C$

$\Rightarrow A \to C$

★ $A \to BDE$ , ~~BD → G ADE~~. $B \to C, G$

$\Rightarrow A \to C$ and $A \to G$

Closure of functional Dependencies :

→ Closure of a set of functional dependencies * given a set of functional dependencies in R say F. Then the closure $F^+$, contains F as well as functional dependencies deducible from F.

* Let S be a super key then $S \to R$ is a F.D.

* If C is a candidate key then ① $C \to R$ is a F.D.

② $\exists$ no $\alpha \subset C$ such that $\alpha \to R$ is a F.D.

☆ r satisfies all F.D.s

☆ F.D. $\alpha \longrightarrow \beta$
Trivial if $\beta \subset \alpha$