

DBMS (Database Management System)

Data :- facts, figures, statics etc. having no particular meaning

Data Base :- collection of inter-related data.

Data Base Management :- Insertion/Deletion like operations
on data called DBM.

Data Base Management :- The software we use to manage data
System :- is called DBMS.

Data Base :- Hardware + software is DataBase
System

ER -
model

Conceptual / High level view

Relational
Model

logical / Implementation
view

In RDBMS

data is in the
form of
table

Normalization

Transaction / CCP

(concurrency
control
protocol)

RA
RC
SQL

File organization
or
Indexing

physical view

Entity Relationship Model (E-R Model)

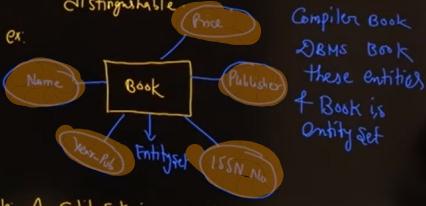
ER model is a Conceptual model by which you can Concise the Structure of the Database, maintain Relationship b/w different Component & Identify the Constraints that occurs in the integrated design of Complete data base system.

Three Components :-

- ① Entity
- ② Attributes
- ③ Relations

Entity

Entity: Real world objects that can be distinguishable.

ex. 

Compiler Book
DBMS Book
these entities f Book is Entity Set

Note: An Entityset is a set of entities of same type that share the same properties.

Attribute :-

Attribute:

Attribute is a specific Part of an entity structure.

It is a mapping from an entity set to its domain Value.



Types of Attributes :-

1) Single Value Attribute: Those attribute which contain single value ... For Ex: Aadhar no. Passport no. Age.

2) Multi Valued Attribute : That attribute contain more than one value for a single entity.... For Ex: Phone No.

3) Composite Attribue : Those attribute further can be divided... For Ex: 

4) Single or Atomic Attribue : Those attributur which cant be further divided ...
For Ex : 

5) Stored and Derived Attribuite :

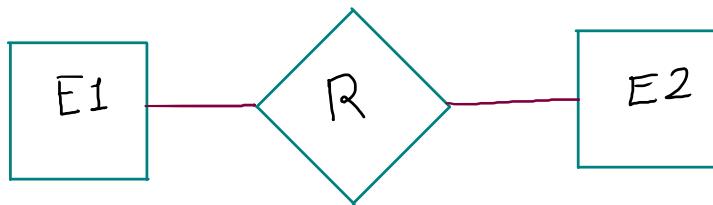
For Ex:

from Date of Birth we can derive age.

so DOB is stored attribute and Age is Derived Attribute

Relationship :-

A relationship is an association among several entities



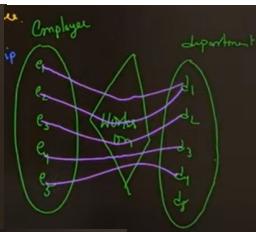
Types of Relationships :-

- 1) One to One
- 2) One to Many (same as Many to One)
- 3) Many to Many

Ex:

Cx: Every Employee works for exactly one department
And a Department can have more than one employee.
New Department need not have any employee.

① Degree: No. of entities participate in a relationship
is known as Degree.
In the above example degree is 2.



2. Cardinality Ratio: Maximum No. of times Entity can Participate in a Relationship

for the above example

Cardinality ratio of Emp = 1

Dep = 2

3. Participation/Existence: minimum No. of times Entity can Participate in a Relationship is known as existence.

Emp = 1
Dep = 0

Note: Whenever Participation or Existence is non-zero
then we can say Participation of an entity total
otherwise Partial.

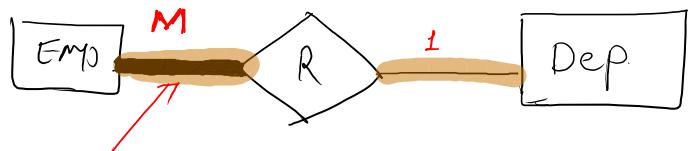
② Cardinality ratios & participation also known as Structural Constraints

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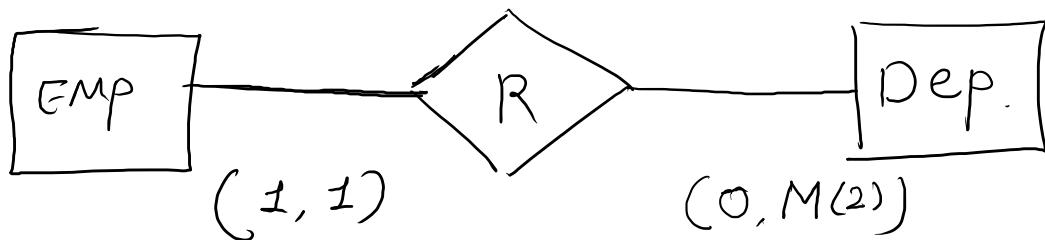
* Single Line - double line representation :-



Total
Participation

* Min-Max Representation :-

(Many to one)

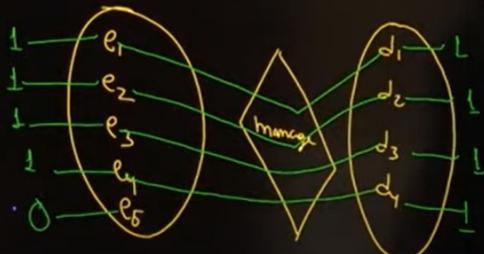


Ex:

Every department should have manager.

Only one employee manage one department.

And an Employee can manage only one department.



One to One

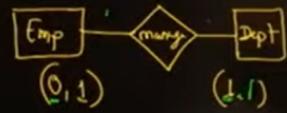
Ans:

① degree = 2

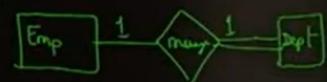
② Cardinality ratio Emp - 1
 Dept - L

③ Participation/Existence Emp - 0 (Partial)
 Dept - 1 (Total)

④ Min-max Representation:

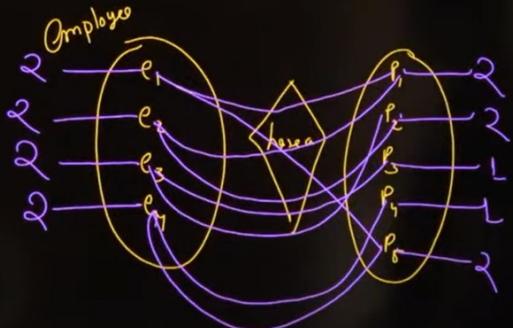


⑤ Single line or double line Representation:



Ex :

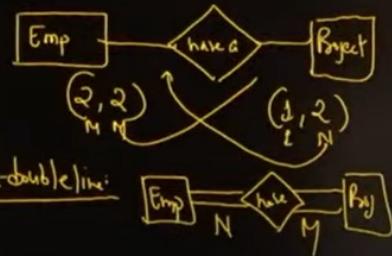
CX:- Every Project have at least one employee & Every Employee have at least one project.



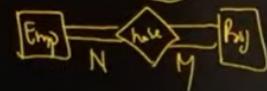
Ans :

- ① Degree : 2
- ② Cardinality :- Emp: 2(M)
Project: 2(N)
- ③ Participation/ Existence :- Emp: (2) M
Project: (1)
- ④ Min-Man Rep :-

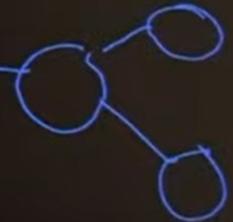
Many to Many



- ⑤ Single line-double line :-



Representation:

- ① Strong-Entity : 
- ② Weak-Entity 
- ③ Relationship 
- ④ Identify Relationship 
- ⑤ Attribute: 
- ⑥ Multivalued Attribute 
- ⑦ Composite Attribute 
- ⑧ Attribute with key: 
- ⑨ Denied Attribute. 

Relational Model :-

(Domain)

Terminology:

(tuple)

A1	A2	A3	A4	A5	A6

Table - Relation

$$R \subseteq D_1 \times D_2 \times D_3 \times \dots \times D_n$$

Tuple - row

Attribute - column

Degree of the relation :-

no. of Attributes

Extension :- Table itself.

Intension :- Schema

Relational Constraint:

- ① Domain Constraint.
- ② Key Constraint.
- ③ Entity Integrity Constraint.
- ④ Referential Entity Integrity Constraint.

* Domain Constraint :-

Domain Constraint:

Domain Constraint specify that what set of values an attribute can take, value of each attribute

X must be an atomic value from domain X.

S.ID	Name	Class	Age
1	X	1	18
2	y	2	19
3	X	2	20
4	X	3	20
5	Z	3	(X)

Not allowed

Kisi bhi attribute wahi value aayegi jo uske domain me ho aur atomic ho.

* Key Constraints (uniqueness)

No two tuples in a relation have same value for all attributes. To ensure this we use Key Constraints:

S.ID	S.Name	Class	Age
1	A	1	18
2	B	2	19
3	A	2	17
4	B	2	19
2	B	2	(19)

Not allowed

Keys :- $K \subseteq R$

Super key :-

set of attributes w.r.t which we can uniquely identify the relationship is known as super key.

- E-ID, SN, Mark
- E-ID, Mark
- E-ID, Grade
- E-ID, S.N.

E-ID	SN	Mark	Grade
1			
2			
3			
4			
5			
6			

- * Every Candidate key is a Superkey but Reverse is not True.
- * Minimal Superkey is a Candidatekey
- * Relation can have more than one Candidatekey.

Candidate key :-

Minimal super key.

Primary key :-

Choose one of the candidate key.

foreign key:

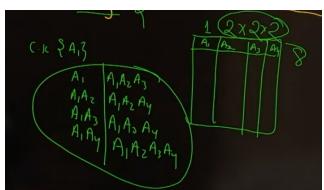


T1 T2

Jab kisi ek table ki primary key dusre table me refer hoti hai to dusre table me wo kisi foreign key kehleti hei,

Q.1 Given table $R(A_1 A_2 A_3 \dots A_n)$ of the given that
 Candidate key of this relation = $\{A_1\}$ then how
 many # of super keys Possible?

Ex :



Candidate Key :- $\{A_1\}$

$A_1 \rightarrow S.K.$

$A_1 A_2 \rightarrow S.K.$

$A_1 A_3 \rightarrow S.K.$

A1	A2	A3	...	An

$$A_1, A_2, A_3, \dots, A_n$$

$$\downarrow \quad \downarrow \quad \downarrow \quad \dots \quad \downarrow$$

$$1 \times 2 \times 2 \times 2 \dots \times 2$$

$$= 2^{n-1}$$

$$R(A_1 A_2 A_3 \dots A_n)$$

$$C.K = \{A_1\} 2^{n-2}$$

$$S.K = \{A_1 A_2\} 2^{n-3}$$

$$S.K = \{A_1 A_3\} 2^{n-3}$$

$$S.K = \{A_1\} \{A_2\} 2^{n-1} + 2^{n-2} - 2^{n-2}$$

$$S.K = \{A_1\} \{A_2 A_3\} 2^{n-1} + 2^{n-2} - 2^{n-3}$$

$$S.K = \{A_1\} \{A_2\} \{A_3\} 2^{n-2} + 2^{n-2} - 2^{n-3}$$

$$S.K = \{A_1 A_2\} \{A_3\} 2^{n-2} + 2^{n-2} - 2^{n-3}$$

$$S.K = \{A_1 A_2\} \{A_3\} \{A_4\} 2^{n-2} + 2^{n-2} - 2^{n-3}$$

$$(C.K = \{A_1\} \{A_2\} \{A_3\} \{A_4\}) 2^{n-2} + 2^{n-2} - 2^{n-3}$$

$$P_{(AUBUB)} = P(A)P(B) + P(C) - P(A \cap B) - P(A \cap C) - P(B \cap C) + P(A \cap B \cap C)$$



③ Entity integrity constraint:

The Entity integrity rules state that no attribute of the Primary key will contain a Null Value.

S-ID	Name	Sex	Age
1	A	2	18
2	B	3	19
3	A	4	20
4	C	2	21
Null			

Not allowed

④ Referential integrity constraint:

This rule states that if a foreign key in Table-1 refers to the Primary key of Table-2 then every value of the foreign key in table-1 must be Null or be available in table-2.

E-ID	Name	Age	D-No
1	A	19	10
2	B	20	11
3	C	18	14
4	D	20	10

F+ T-2

D-No	D-L
10	Blwps
11	Indm
12	Gml

Constraints Violation : Using Insert
Delete
Update.

- ① Domain Constraint ✓
 - ② Key Constraint ✓
 - ③ Entity Integrity Constraint,
 - ④ Referential Integrity Constraint
- May be violated using insert -

Insert : All

Delete :-

Referential
Integrity
Constraint.

