Toppersnotes
Unleash the topper in you

ToppersNotes

GATE

COMPUTER SCIENCE & INFORMATION TECHNOLOGY

VOLUME-III

DATABASES & DIGITAL ELECTRONICS

Sierra Innovations Pvt. Ltd.

Contents

Introduction

. :- Abstract in nature (Row fact)

nformation :- Data with added meaning.

Record :- Collection of logically related data

ex:-

< 501 Raj 530 >

Database :- Collection of similar records.

(OR)

Collections of logically related data.

Management :- Through set of programs

DBMS :- Collections of logically related data and set of programs to access those data.

Applications :-

- Banking
- Telecommunications
- Reservation systems
- Sales
- Scientific applications

Goal of DBMS :- Effective storage and retrieval of Data from DBMS.

D.S	Database	DBMS	
Tree	Hierarchial DB	HDBMS	outdated
Graph	Network DB	NDBMS.	
Table	Relational DB	RDBMS ✓	
Objects	Objectoriented DB	OODBMS	
Object/Table	Object relational DB	ORDBMS	

Conceptual Database Design using C Entity-Relationship (ER) Model

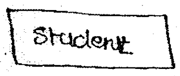
Components of E-R Model

1) Entity : An object in the realword.
"Noun"

ex:- Student Book Account

Physical entity logical entity

2) Entity set :- Collection of similar entities

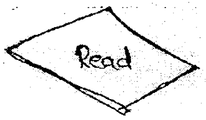


← Rectangle

3) Relationship :- Association among the entities
"Verbs"

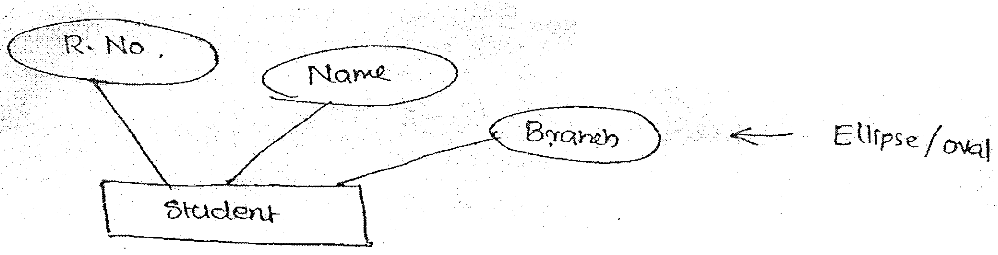
ex:- Reading
Buying

4) Relationship set :- Collection of similar relationships.



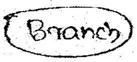
← Diamond.

5) Attributes :- which describes an entity

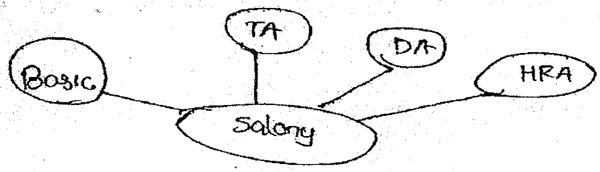


<u>Classification of Attributes</u>

1) <u>Simple attribute</u> :- Which can-not be divided further

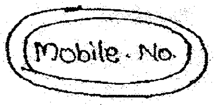


2) <u>Composite attribute</u> :- which can be divided further.



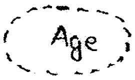
3) <u>Single Valued attribute</u> :- which takes one Value per an entity

4) <u>Multivalued attribute</u> :- which takes more than one Value per an entity

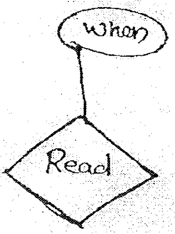


5) <u>Stored attribute</u> :- which does not require any updation

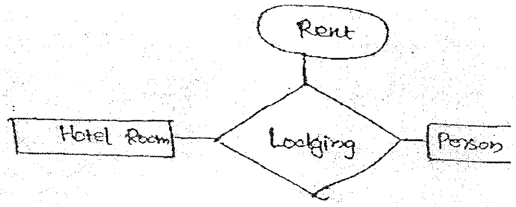
6) <u>Derived attribute</u> :- The Value of an attribute can be derived from other attributes.



7) Descriptive attribute :- which gives information about the relationship set



ex:-



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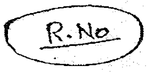
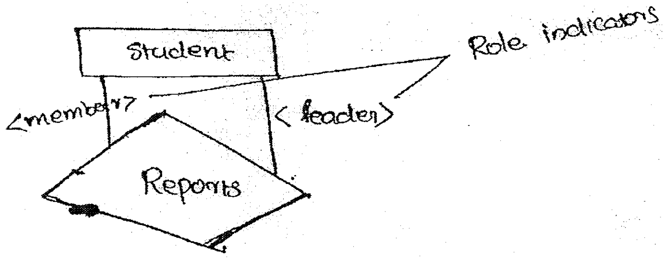
8) Key attribute :- which uniquely identifies an entity in the entity set.

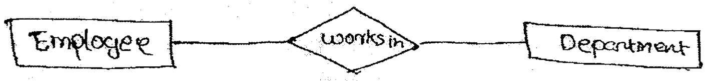


6 Degree of relationship set :- Specifies the no. of entity sets participates in a relationship set.

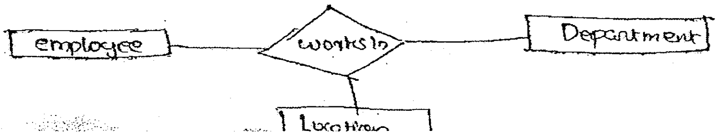
1) Unary :- Relationship among ~~one entity~~ two entities of the same entity set. (Recursive relationship set)



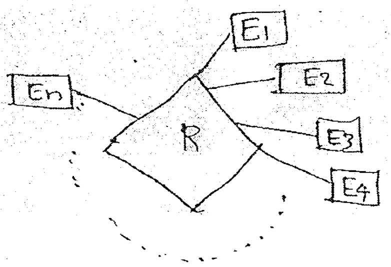
2) Binary Relationship set :- The relationship among two entity sets.



3) Ternary relationship :- Relationship among three entity sets.

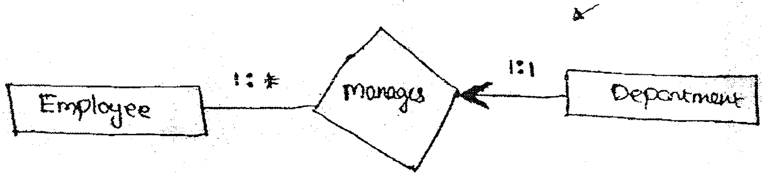


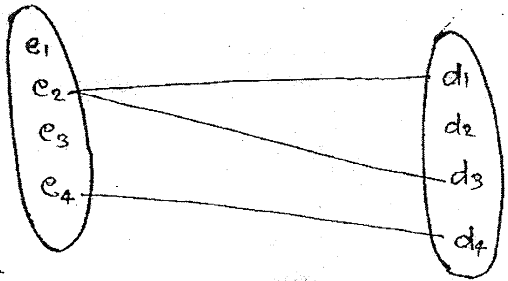
4) n-ary :- A Relationship among n- entity sets



7] **Key Constraint** :- An entity is acting as a key to another entity through the relationship set it is denoted in E-R model using an Arrow

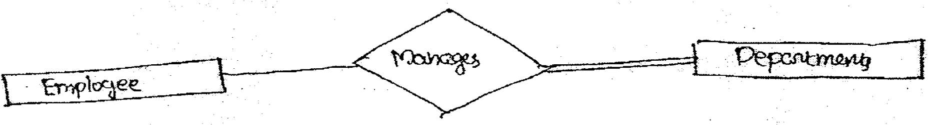
" Each department is managed by atmost one employee".

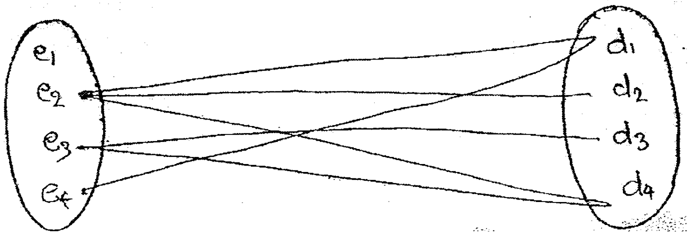




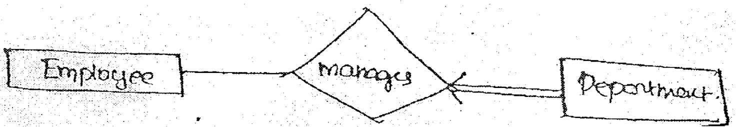
8] **Participation Constraint** :- If every entity in the entityset participates in a relationship set is called total participation denoted by double line (Thick line). otherwise it is called partial participation. (Thin line or single line)

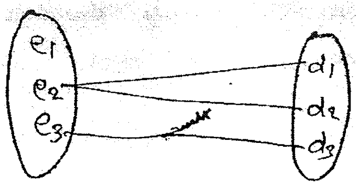
" Eeach department is managed by atleast one employee'





"Each Dept is managed by exactly one employee"

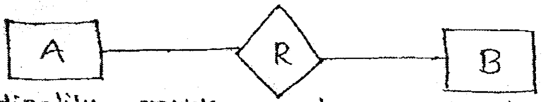




* Mapping Cardinality (Cardinality Ratios)

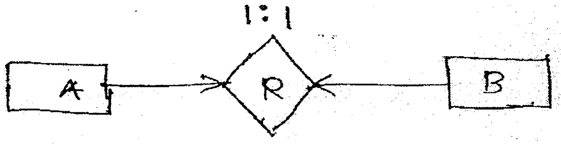
It Express the no of entities to which another entity can be associated via a relationship set.

*(only on binary-relationsh

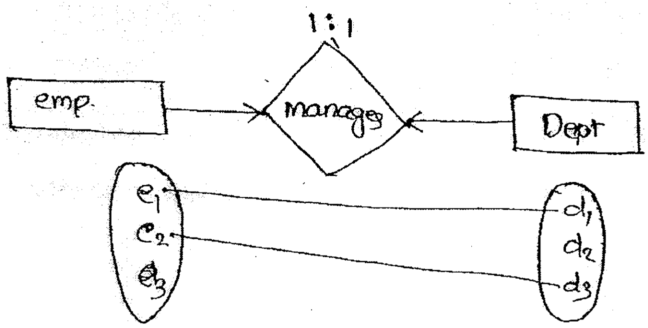


Note:- The cardinality ratios can be expressed on a binary relationship set only

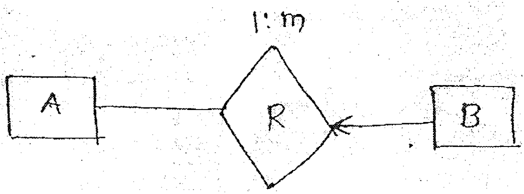
⊛ one to one (1:1)



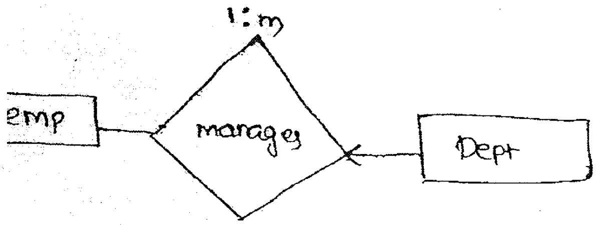
An entity in A is associated with atmost one entity in B and an entity in B is associated with atmost one entity in A.

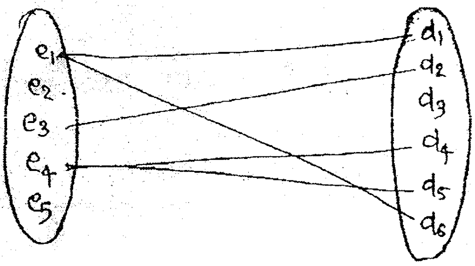


3) one-to-many (1:m)

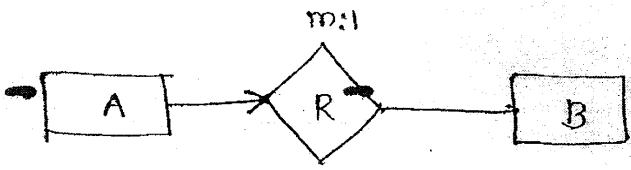


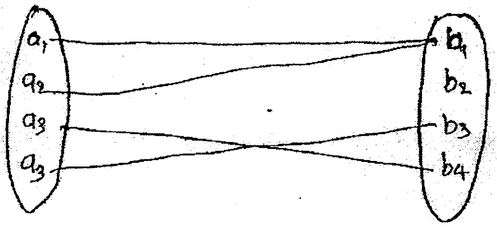
An entity in A is associated with zero or many entities in B and an entity in B is associated with atmost one entity in A.





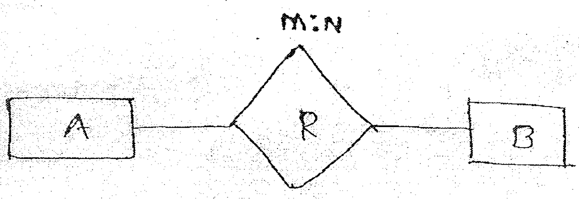
4) many-to-one (M:1)

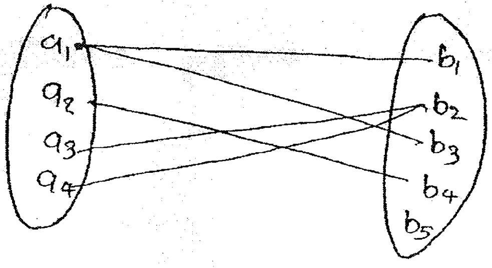




Note: In one-to-many and many-to one relationship set the key constraint is from an 'm' side entity to the relationship set.

④ Many-to-many (M:N)

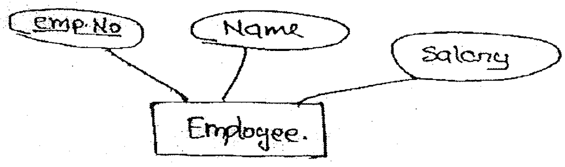




Strong entity set :-

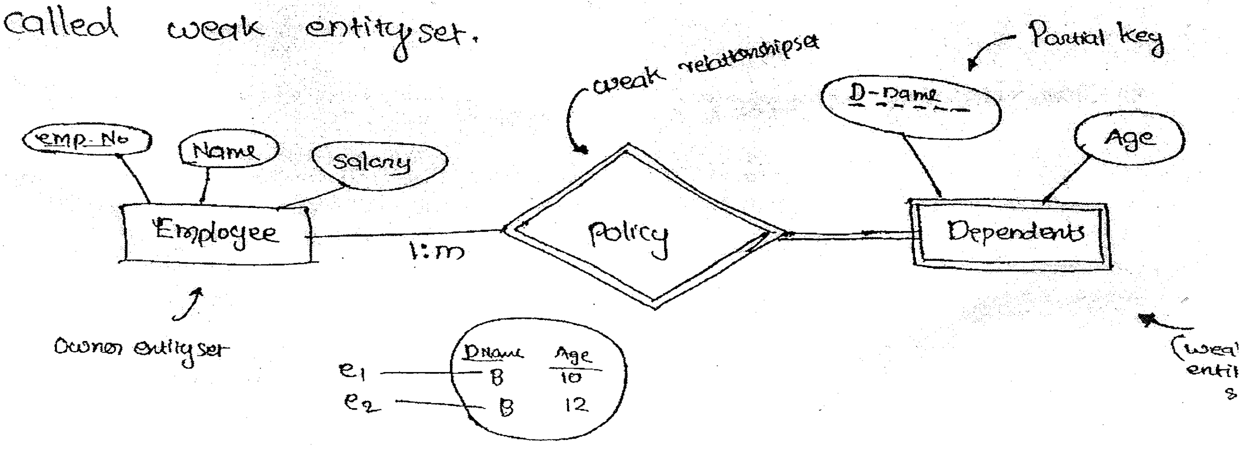
An entity set which has a key is called strong entity set

Ex:-



Weak Entity set :-

An entity set which does not havea key attribute is called weak entity set.



→ Partial key are descriminating attribute.

→ Weak relationshipset (or) Identifying relationshipset

→ Owner entity set (or) Identifying owner

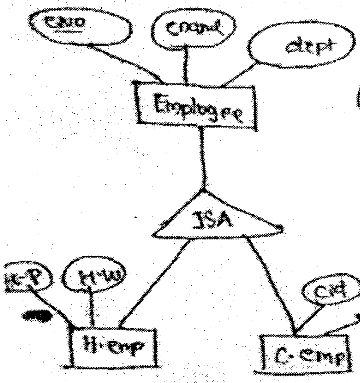
→ The owner entity set to the weak relationship set the cardinality ratio is one to many

→ ~~The weak entity set is the~~

The participation of weak entity set to the identifying relationship set is always total.

→ The weak entity set is identified using partial key and key of the owner entity set

Class Hierarchy



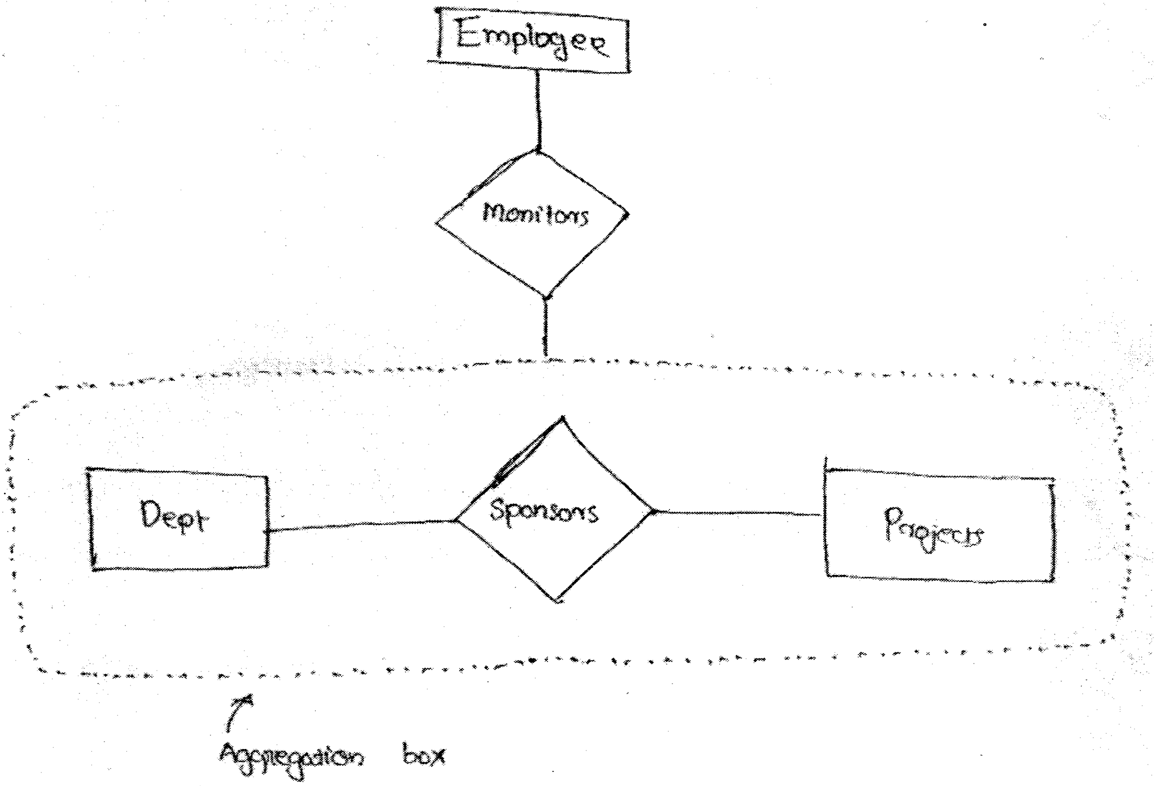
Generalization ← Grouping of entities

Specialization ← Dividing into Sub entities

→ Class hierarchy notation (ISA - triangle)

Aggregation

Aggregation allows us to indicate that a relationship sets participates in another relationship set.



Advantages of E-R Model

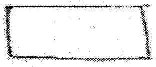
1) Easy to understand
2) It is an effective communication tool

Disadvantages of E-R model

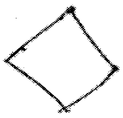
1) Limited constraint capability.
2) Loss of information content

Approach : Top-down approach

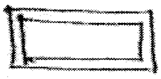
E-R Components



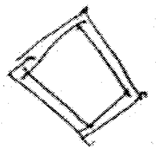
← entity set



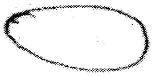
← Relationship set



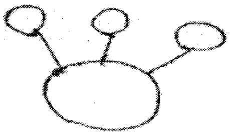
← weak entity set



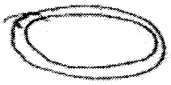
← weak ~~entity~~ relationship set (Identifying relationship set)



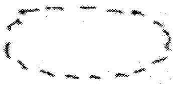
← attribute.



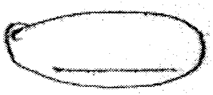
← Composite attribute



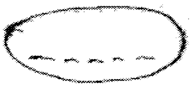
← multivalued attribute



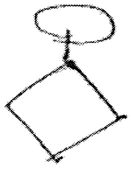
← derived attribute



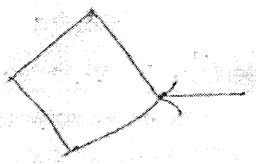
← Key attribute



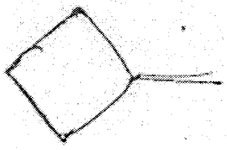
← Partial key or descriminating attribute



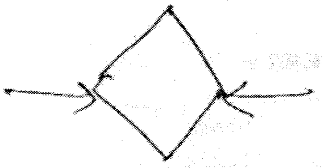
← Descriptive. attribute



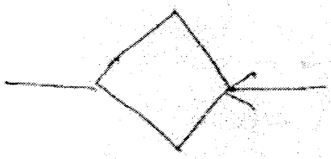
← key constraint



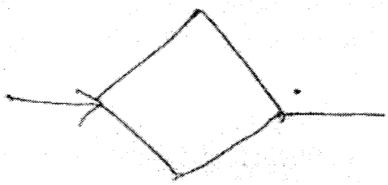
← total participation



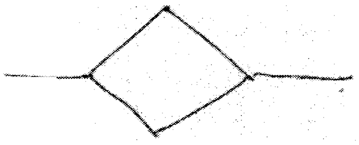
1:1 (one to one)



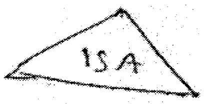
1:m (one to many)



m:1 (many to one)



many to many (M:N)



← class hierarchy

← aggregation box

Logical Database Design using "relational Model"

Relation :- → Rows & Columns
(Table)   Records   Attributes
                 Tuples

described using

- Relation Schema :- Structure
- Relation instance :- tuples

Student

Rno Number(2) Primary key	Name char(10) Not null	Branch char(3)
1	A	CSE
2	B	IT

Degree of a relation :-

Degree specifies No. of columns present in a tuples ③

Cardinality of a relation :-

specifies no. of rows ②

RDBMS :- Collection of relations

Integrity Constraints :-

Is a condition specified on a database schema and restricts the data that can be stored in an instance of the database.

ex :- PRIMARY KEY, NOT NULL, UNIQUE

Legal Instance :- The instance, which satisfies all the integrity constrains specified on a database schema.

→ Otherwise such an instance is called Illegal instance

Key Constraints

It is a set of fields of a relation has a unique identifier for a touple. That is each touple in a relation is identified using a set of attributes.

Student (RNo, Name, father, Branch, Passport)

1) RNo ← Key

2) (Name, father) ← key

~~A~~	P
A	Q
B	Q

3) Passport ← key

4) (RNo, Name) ← key

5) (RNo, Passport) ← key

I) Candidate key :-

It is a minimal set of attributes which uniquely identifies a touple in a relation

ex:- RNo , (Name, father) , Passport

II) Super key :-

It is a set of attributes which contains a key (candidate key)

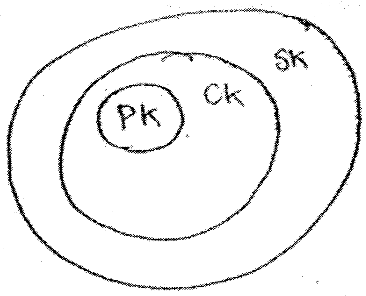
ex:- (RNo, Passport) , (RNo, Name), RNo, Passport , (Name, f

→ Every candidate key is called a super key, but every super key need not be a candidate key

III) Primary key :-

Among all the available candidate key one can be identified as primary key.

ex:- Rno.



IV) Foreign key constraint (Referential Integrity Contraint)

Student

Rno	Name	Branch
1	A	CSE
2	B	IT
3	C	CSE

(Referenced relation)(Parent)

Registration FK

C.No	CName	Rno
101	DBMS	1
102	CD	1
103	TOC	3
104	PL	

(Referencing relation) (child)

→ The values present in foriegn key must be present in primary key of referenced relation. Foriegn key may contain duplicates and null values.

Parent table	Child table
✓ Insert < 4 D ECE >	X Insert < 105 GT 5 >
X Delete < 1 A CSE >	✓ Delete < 103 TOC 3 >

→ Deletion from the referenced relation and insertion into the referencing relation may violate foriegn key constraint.