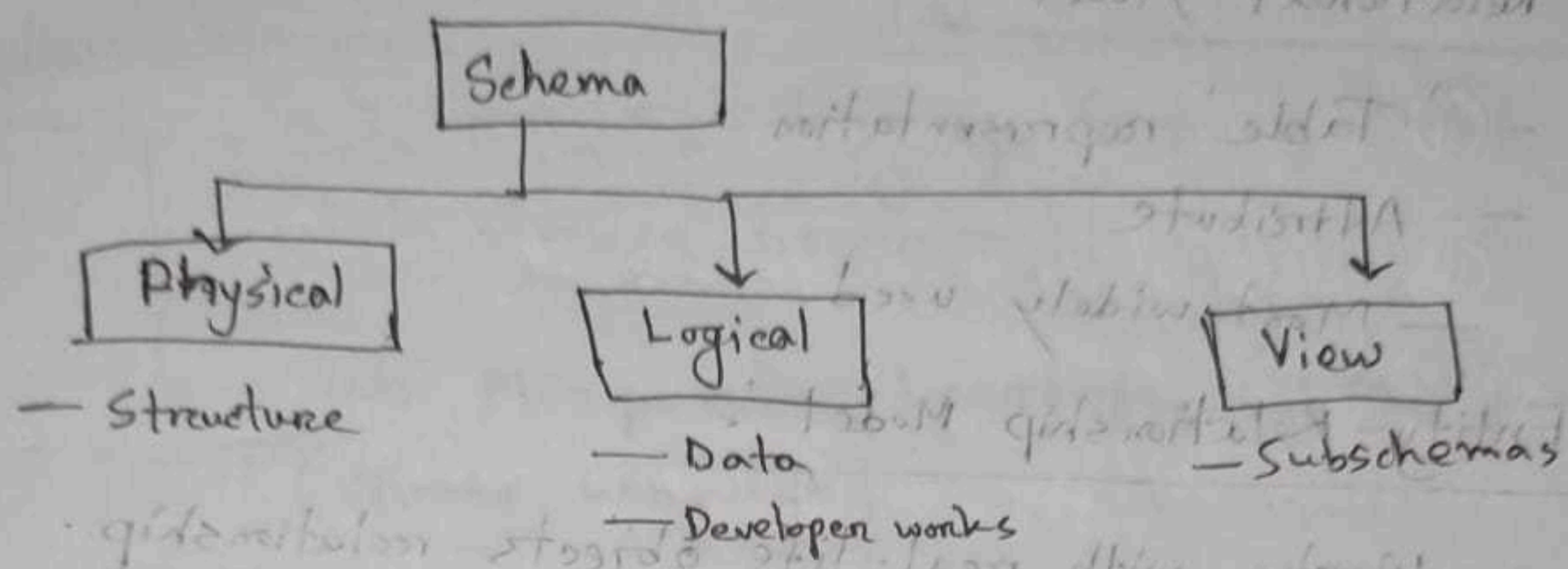
Lecture-2

DBMS

07-09-23



⇒ Physical independence — (logical level এর কোনো Change Physical level-এ প্রভাব ফেলবে না,)

Logical level can accessed physical level but can't modified it.

Data Model

Conceptual structure of db

Data Model

- → Relational Model
- → Entity-Relationship "
- → Object-based "
- → Semi-structured "

→ Network Model, Hierarchical Model

Relational Model :

- 'Table' representation
- Attribute
- Most widely used

* Entity-Relationship Model :

- Works with real-life objects relationship
- Objects are known as "Entity"
- 'Entity' can have — attributes
- E-R Diagram

Object-based Model :

- Data abstraction, Encapsulation, Polymorphism
- Java, C++, C# — (object oriented data model)

Semi-structured Model :

- Single type, multiple attributes
- Extensible Markup Language (XML)

gsebwhj

Database Language

- → Data Definition Language (DDL)
  (Data storage Language)
- → Data Manipulation Language (DML)
  (Query Language)

3 Pie

3 Pie

⇒ 2 types of DML
- → Procedural
  (which 'data' needed and How) — Process given. Piece
- → Declarative
  (Only data info given)
  what data needed

ng

⇒ DDL

— Data-storage language

— Can add integrity constant (predefined constant) — 3

~~⊗~~ Integrity ~~constant~~ Constraints

- → Domain — Data types are defined
- → Referential integrity — Integrity from another database
- → Assertion — New constraints can be added
- → Authorization — Specific access

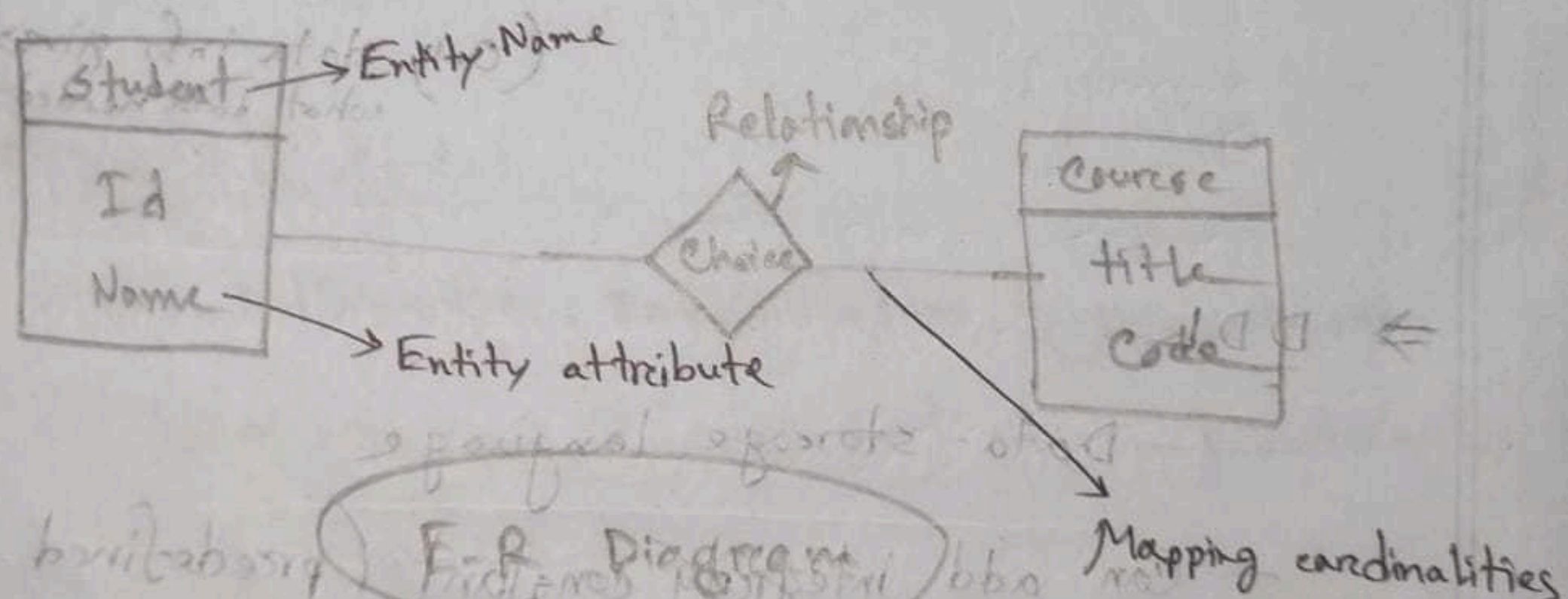
Development Process :

(i) Requirement analysis

(ii) Conceptual view (Model)

(iii) Implementation

E-R Model



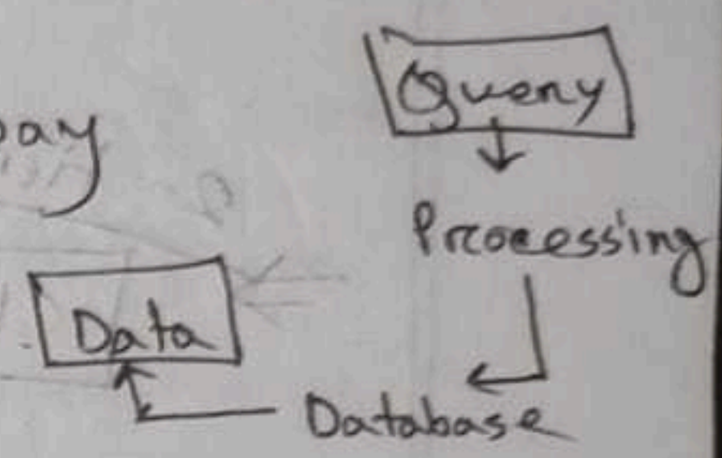
Normalization :

— Storing data in an effective way in DBMS

Data storage and querying

— Data storing way → RAID

— Querying → Data processing way



Transaction Management

— controlling transaction data

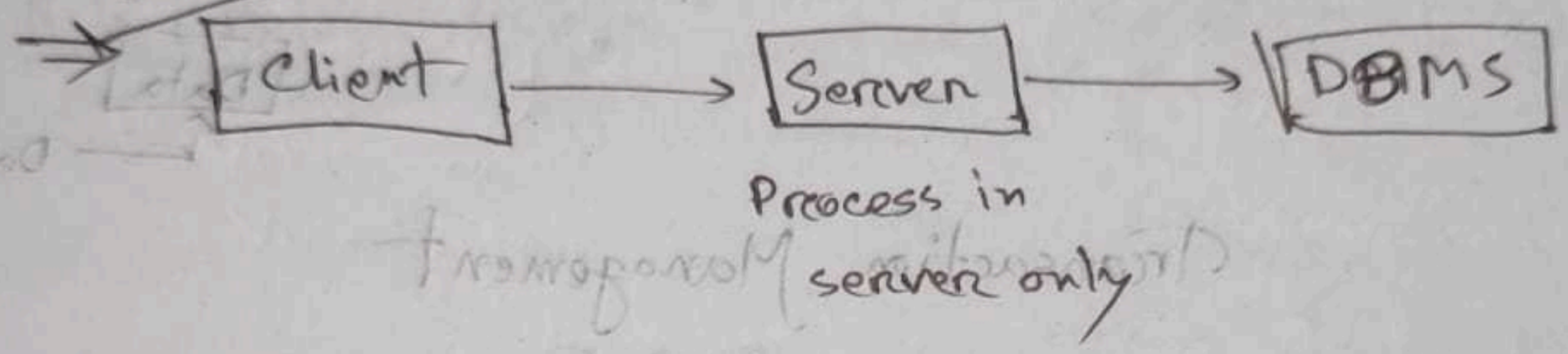
— Log file (info of transaction data)

Data Administrator

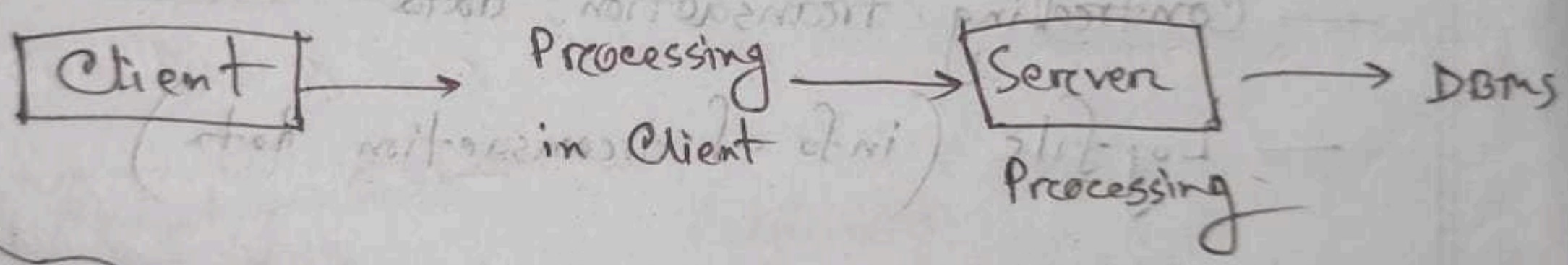
Database Architecture

- → 2-tier architecture
- → 3-tier architecture

⇒ 2-tier



⇒ 3-tier



→ Processing in both client, server

Relational Table Language

14.9.23

DDL, DML

Relational operation

- Select/view (Select tuple & show) → δ
- Projection (Select Attribute & show) → π
- Join (Merge table) → $\times, \bowtie, \alpha$
- Logical (Union or Intersection like operation) → $\cap$, $\cup$
  Set Op.

Relational Algebra

Join
- Cartesian → $\times$
- Natural → $\bowtie$
- Inner
- Outer

St_info

ID	Name
1	A
2	B
3	C

Get data where id < 3

$\delta_{(id<3)}$ (st_info)

$\boxed{\text{Op_name}_{(condition)} (\text{Relation name})}$

Only show id from table

π_{id} (st_info)

for multiple attribute

$\pi_{id,name}$ (St_info)

Join Operation

TA

id	Name
1	A
2	B

RA

id	Cgpa
1	2.75
2.	3.75

Cartesian

id	Name	id	Cgpa
1	A	1	2.75
1	A	2	3.75
2	B	2	2.75
2	B	1	3.75

$\Pi_{name, cgpa}(TA \times RA)$

Natural

id	name	id	Cgpa
1	A	1	2.75
2	B	2	3.75

$\Pi_{id, name}(\sigma_{id = id}(TA \bowtie RA))$

$TA.id = RA.id$

$\pi_{id}(TA \bowtie RA)$

Set operation

$\delta_{id}(TA) \cup \delta_{cgpa}(RA)$

$\delta_{id}(TA) \cap \delta_{cgpa}(RA)$

$\delta_{id}(TA) - \delta_{cgpa}(RA)$

chapter - 6 (6.1, 6.2)

chapter-3

- → SQL Query part (3.1)
- → DDL (3.2)
- → 3.2.1
- → Basic Schema Defition

Join

- → Natural Join ($\bowtie$)
- → Cartesian Join ($\times$)
- → Outer Join
  - → Left outer Join ($\bowtie$)
  - → Right " " ($\bowtie$)
  - → Full " " ($\bowtie$)

* 'Projection' show unique value if it have duplicate value

⇒ Outer Join = Natural output + Reference table remain value

t1

ID1	Name
1	A
2	B

t2

ID2	CGPA
1	3.5
3	2.5

Left outer join :

ID1	Name	ID2	CGPA
1	A	1	3.5
2	B	—	—

Null Value

Right Outer Join :

ID1	Name	ID2	CGPA
1	A	1	3.75
–	–	3	2.5

Full Outer Join :

ID1	Name	ID2	CGPA
1	A	1	3.5
2	B	–	–
–	–	3	2.5

$\Pi_{id2, Name, CGPA} (t1 \bowtie t2)$ — Full outer join

Renaming :

→ Different table-গুলোর attribute একই হলে Renaming করতে হয়।

example :

t1.id , t2.id } t1 ও t2 table-এর একই attribute 'id' হলে,

→

T_1

ID	Marks
1	100
2	150

Virtual T_1

ID	Marks
1	100
2	150

$T_1 \times T_1$

ID	Marks	ID	Marks
1	100	1	100
1	100	2	150
2	150	1	100
2	150	2	150

100 < 150

— Get maximum value from T_1

↑

Ref. table – Min value

$T_1.Marks < ICE.Marks$

↑

$\rho_{ICE}(T_1)$

→ Renaming for same table :—

ρ_x (Relation)

$\rho_{ICS}(T_1)$ —— Virtual name

$\rho_{x(Column, Column)}$ (Relation) → for renaming Column

25-09-23

CT-1

Chapter - 1, 2.

Chapter — 6.1 (Algebric expression)

—— Relation Algebra নিয়ে

—— কুল বের করা

$\pi_{id, name, cg_{id_2}}(t_1 \bowtie t_2)$

Renaming: same table + Different table এর মধ্যে operation চালানোর,

Diff — stud_ID, std_CG.

π [Std_int.ID, Name, Std_CGPA.ID]

same — একই table এর উপর multiple operation

T_1

ID	Marks
1	100
2	150

×

ID	M
1	100
2	150

Ref — Min

Highest

cartesian

$T_1 \times T_1$

ID	M	I	M
1	100	1	100
1	100	2	1500
2	150	1	100
2	150	2	150

Mark < Mark

R V

1 100 2 150

Renaming for same table

ρ_x (relation)

reference table এর নাম

$\rho_x(T_1)$

variable name

Best

$\rho_{ICE}(T_1)$ virt

virtual table এর name

Rename

$T_1.Mark < ICE.Mark$

Servers of shell

$\rho_{x(A_1, A_2, \ldots)}$ (Relation)

← column selection

$\rho_{x(Roll, Num)}$ (Relation)

Mark < Num

CT-1 — Chap 1, chap-2, Ch-6.1

25 তারিখ
2 টার সময়
201

library building

Department of Information and Communication Engineering
Noakhali Science and Technology University
Class Test-01, 2019

A

Course Code: ICE-2207 **Course Title: Database Management Systems**
Time: 30 Minute **Marks: 25**

a. Define instance and schema. Describe about the drawbacks of using file systems to store data. 5

b. Define query processing. Why do we need transaction management in DMBS? 5

c. What is primary key? Explain about the natural join with example. 5

d. i. Retrieve all employees in department ICE whose salary is between Tk. 20000 and 40000. 3

ii. Find the names and average salaries of all departments whose average salary is greater than Tk. 30000 3

iii. Find the total number of (distinct) students who have taken course sections taught by the instructor with *ID 180120M*. 4

Information and Communication Engineering

Class Test-1

Marks: 25 Time: 35mins

1. Define Database. Briefly explain what are the drawbacks of using a file system over database system? 1+6
2. Suppose you want to design a database for your department. Now write down and elaborate on the process to design the general structure of your database. 8
3. How a query is processed? Explain with an appropriate diagram. 4
4. Differentiate between the Primary key and the Candidate key. 2
5. Suppose a relation (r) is given below- 4

A	B	C	D
α	α	1	7
α	β	5	7
β	β	12	3
β	β	23	10

Now find out

(i) $\sigma_{A=B \wedge C \leq 5}(r)$

(ii) $\Pi_{A,B}(r)$

23:10

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why do we need transacti...

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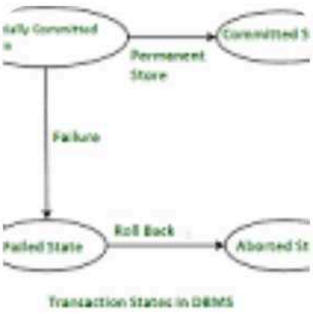

Uses of Transaction Management

The DBMS is used **to schedule the access of data concurrently**. It means that the user can access multiple data from the database without being interfered with by each other. Transactions are used to manage concurrency. It is also used to satisfy ACID properties. May 31, 2023

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Transaction Management - GeeksforGeeks

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data model in dbms

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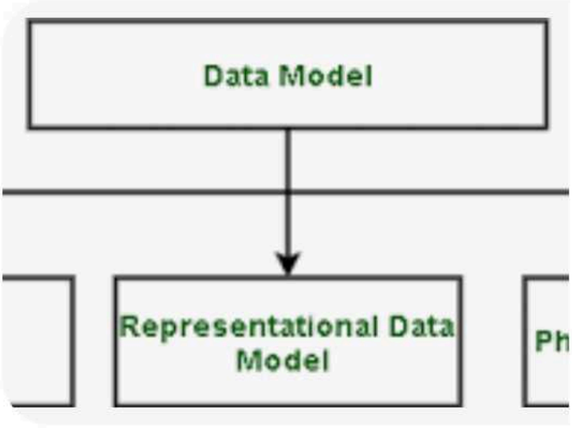

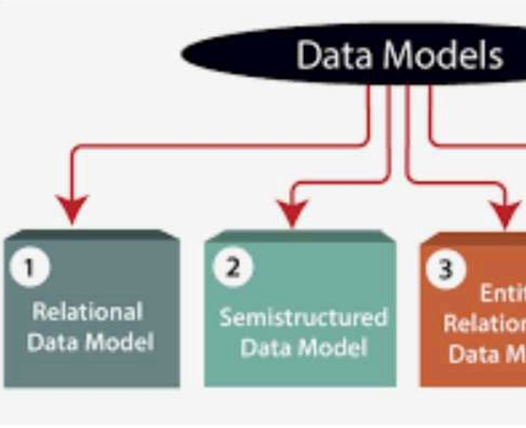

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Data models in DBMS help to understand the design at the conceptual, physical, and logical levels as it provides a clear picture of the data making it easier for developers to create a physical database. Data models are **used to describe how the data is stored, accessed, and updated in a DBMS**.

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Data Models in DBMS - Scaler Topics

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integrity constraints in db...

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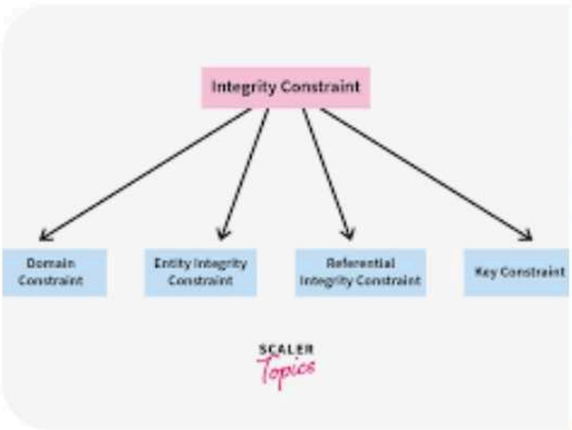

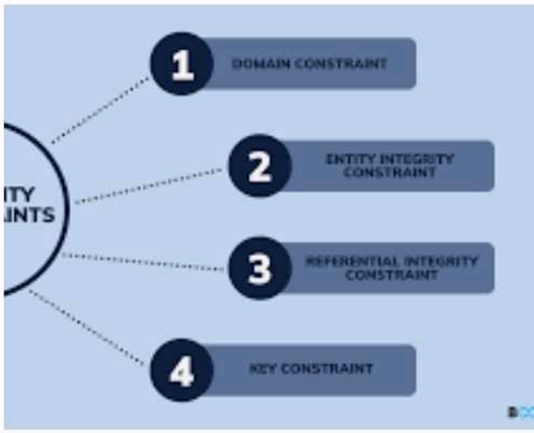

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What are Integrity Constraints in DBMS? In Database Management Systems, integrity constraints are pre-defined set of rules that are applied on the table fields(columns) or relations to ensure that the overall validity, integrity, and consistency of the data present in the database table is maintained.

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Integrity Constraints in DBMS - Scaler Topics

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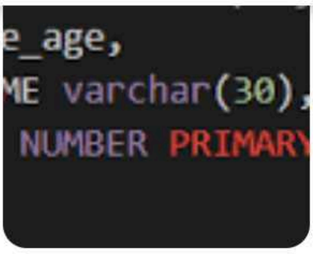

Domain Constraints are **user-defined columns that help the user to enter the value according to the data type**. And if it encounters a wrong input it gives the message to the user that the column is not fulfilled properly. Sep 1, 2021

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Domain constraints in DBMS - GeeksforGeeks

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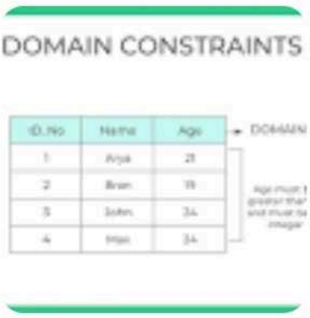
What is an example of a domain constraint in database?



For example, if you are having a column called month and you want only [Jan, Feb, March.... dec] as values allowed to be entered for that particular column which is referred to as domain for that particular column.

Feb 1, 2023

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domain constraints in dbms

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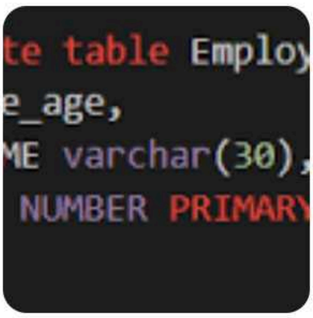

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What is a domain in DBMS with example?

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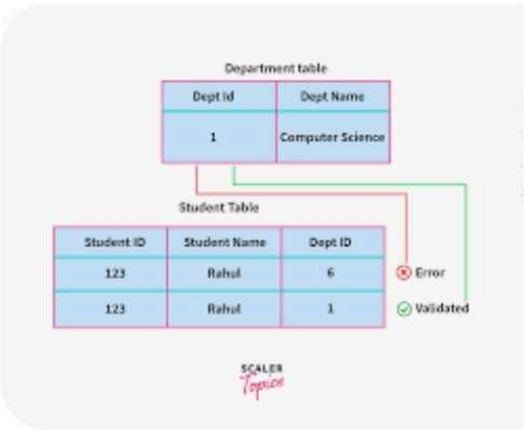

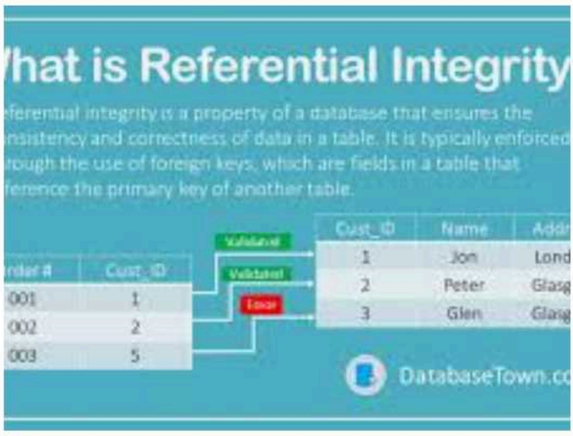

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Referential integrity **refers to the relationship between tables**. Because each table in a database must have a primary key, this primary key can appear in other tables because of its relationship to data within those tables. When a primary key from one table appears in another table, it is called a foreign key .

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Referential integrity - IBM

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referential integrity in dbms

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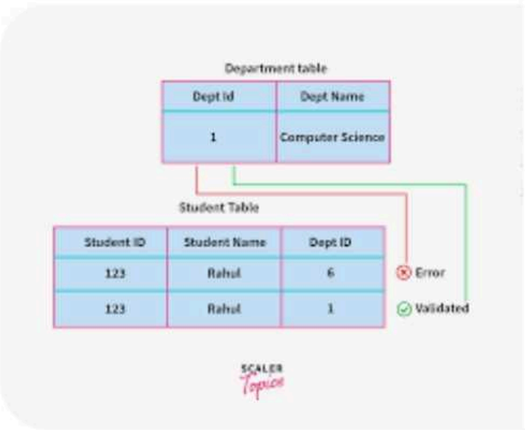

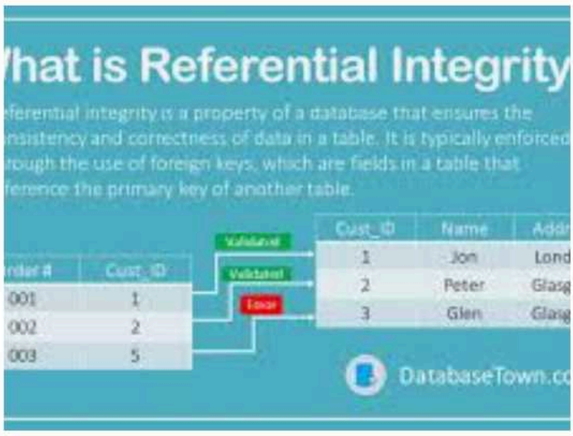

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entity set in dbms

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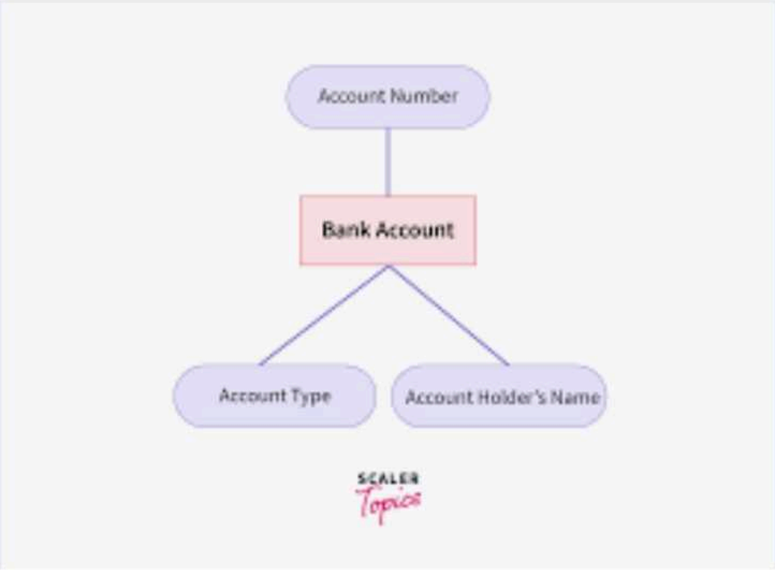

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An entity set in DBMS is **a set that collectively represents a group of entities of a similar type**. For Example: An entity set of cars, an entity set of bank accounts, etc. In DBMS, the whole table in the tabular representation of data is an entity set, while each row inside this table is an entity.

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Entity in DBMS - Scaler Topics

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relationship set in dbms

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A relationship set is **a set of relationships of the same type**. Formally it is a mathematical relation on (possibly non-distinct) sets. where is a relationship. For example, consider the two entity sets customer and account.

Sep 10, 1995

https://www2.cs.sfu.ca › node3

Relationships & Relationship Sets

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What is relationship set and its degree in DBMS?

What is the difference between relationship sets and entity sets?

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normalization in dbms

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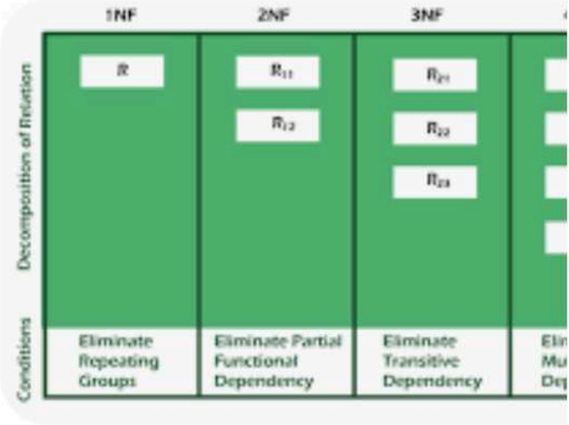

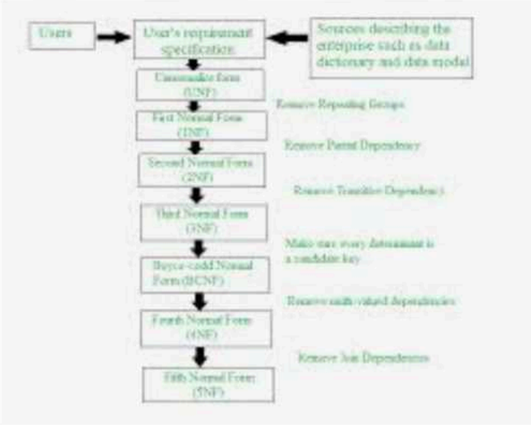

Normalization is **the process of minimizing redundancy from a relation or set of relations**. Redundancy in relation may cause insertion, deletion, and update anomalies. So, it helps to minimize the redundancy in relations. Normal forms are used to eliminate or reduce redundancy in database tables.

7 days ago

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Normal Forms in DBMS - Database Normalization - GeeksforGeeks

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database storage and quer...

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Data Storage and Querying in DBMS

Feb 4, 2022 — Data Storage and Querying in DBMS ... Database Management System is the collection of interrelated data/information or set of programs that ...

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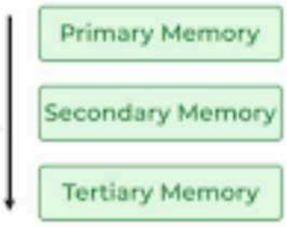
What is data storage and query in DBMS?



Data Storage Manager also known as “Database Control System”, is generally **a program that provides an interface between the data/information stored and the queries received**. It helps us to maintain the integrity and consistency of the database by applying the constraints. Feb 4, 2022

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Data Storage and Querying in DBMS -

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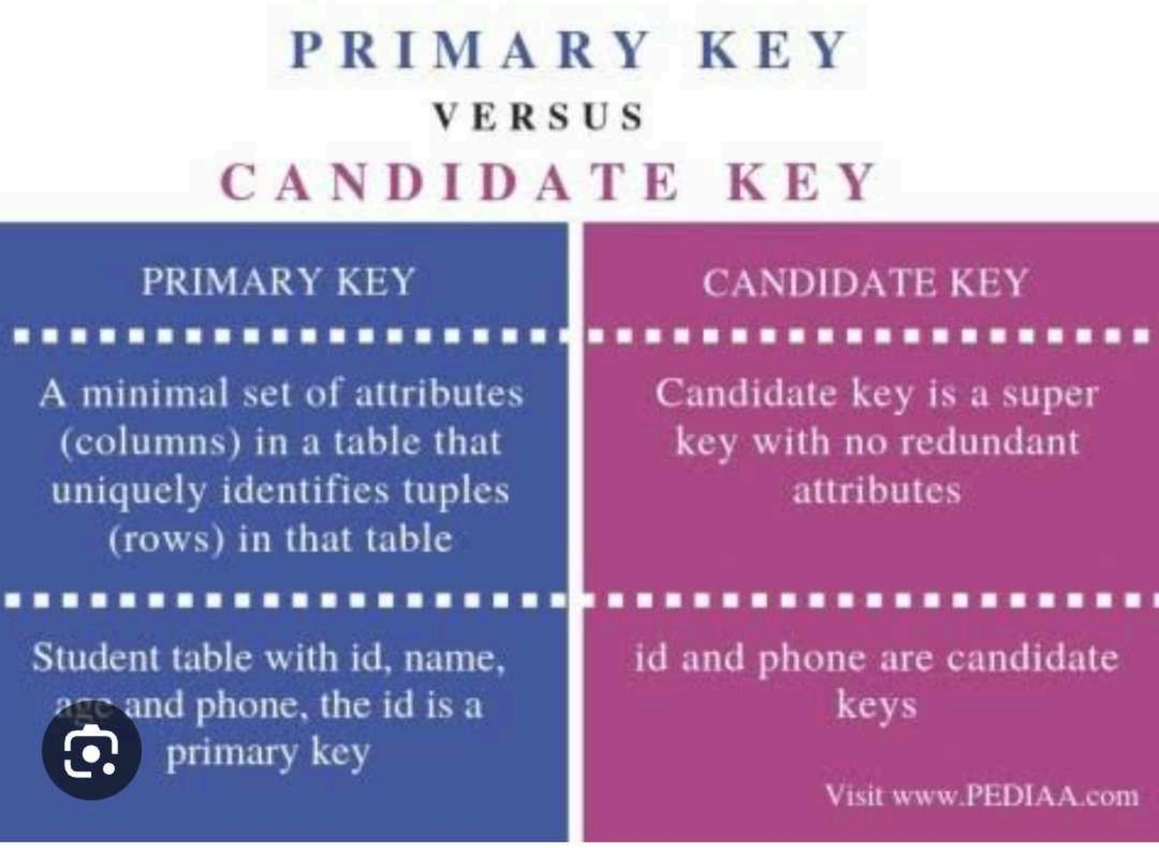

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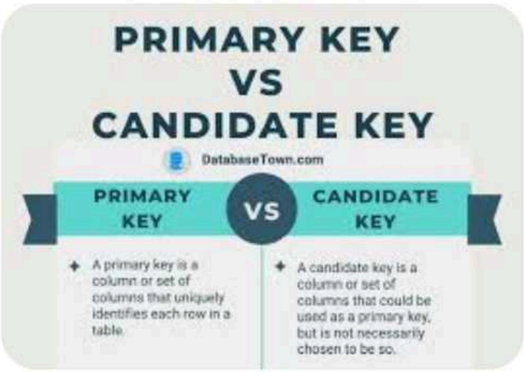

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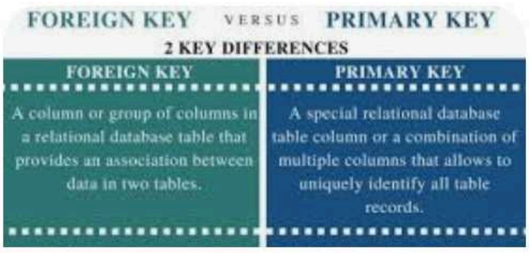

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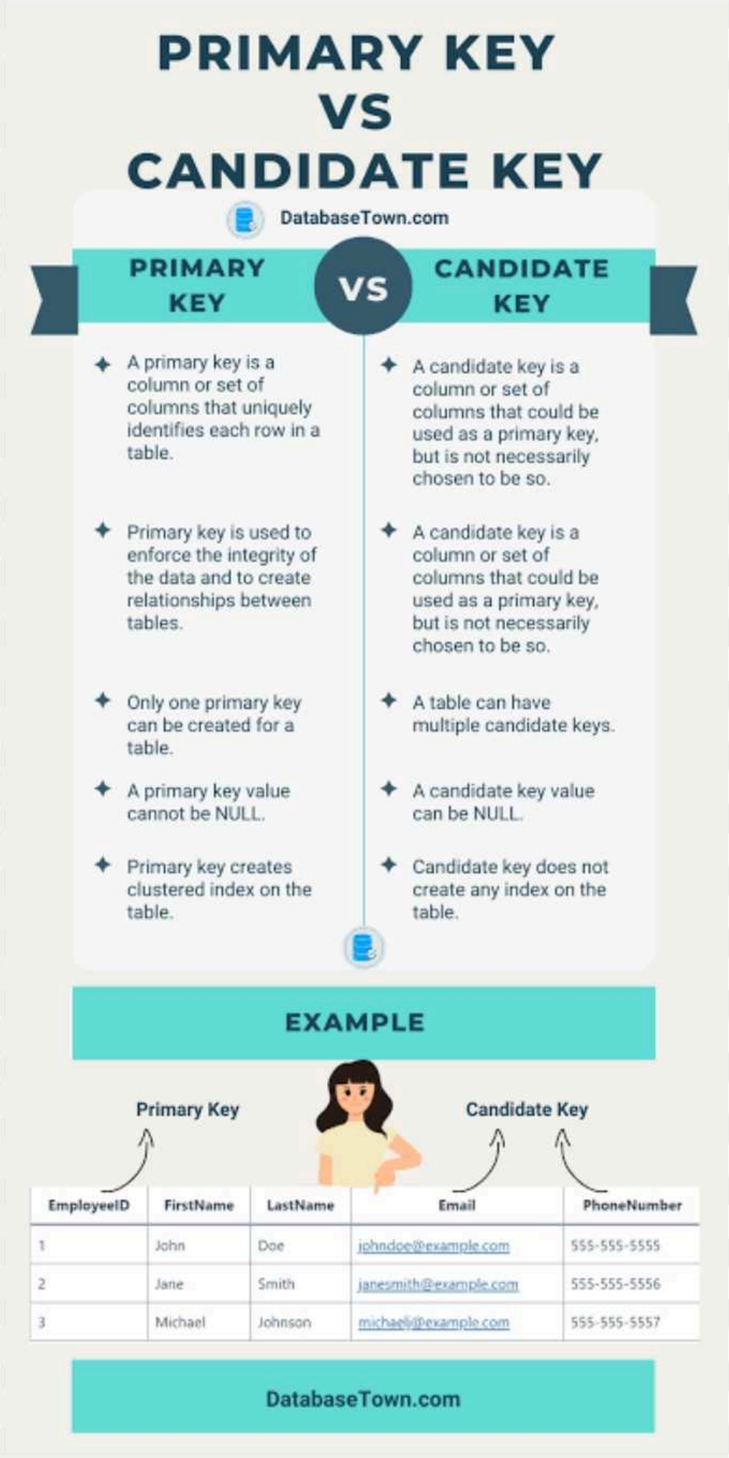

Difference Between Primary Key vs Candidate Key -...

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A primary key is used to ensure data in the specific column is unique. A foreign key is a column or group of columns in a relational database table that provides a link between data in two tables. It uniquely identifies a record in the relational database table.

May 8, 2023

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Difference between Primary Key and Foreign Key - GeeksforGeeks

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Difference Between

PRIMARY KEY VERSUS FOREIGN KEY

Primary Key	Foreign Key
A primary key uniquely identifies a record in the relational database table.	A foreign key refers to the field in a table which is the primary key of another table.
A table can contain only one primary key.	A table can contain more than one foreign key.
No two rows can carry duplicate values for a primary key attribute.	A foreign key can contain duplicate values.
A primary key does not allow Null values.	A foreign key can contain Null values.
A primary key constraint can be implicitly defined on the temporary tables.	A foreign key constraint cannot be enforced on local or global temporary tables.
A primary key constraint cannot be dropped from the parent table which referred to the foreign key in the child table.	A foreign key value can be dropped from the child table even if it is referred to the primary key of the parent table.

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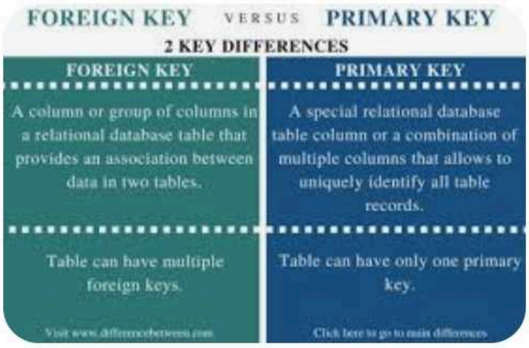

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PRIMARY KEY VERSUS FOREIGN KEY

PRIMARY KEY	FOREIGN KEY
A specific choice of a minimal set of attributes or columns that uniquely specify a tuple or a row in a table	A field or collection of fields in one table that uniquely identifies a row of another table or the same table
Related to a single table	Related to two tables
Value cannot be null	Value can be null
Cannot have duplicate values	Can have duplicate values
There can only be a single primary key in a table	There can be multiple foreign keys in a table
Used to identify the records of the table uniquely	Used to link two tables together

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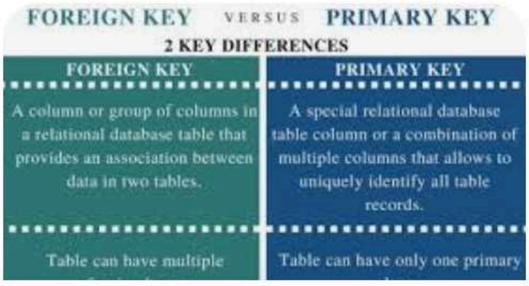

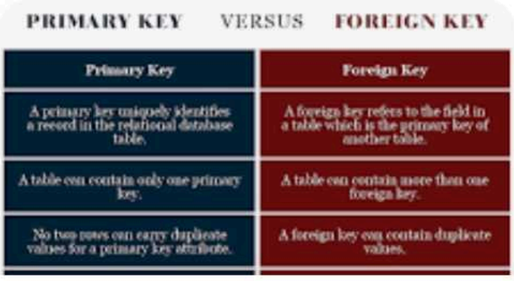

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Difference Between Primary Key and Foreign Key

Primary Key	Foreign Key
Primary key uniquely identify a record in the table.	Foreign key is a field in the table that is primary key in another table.
Primary Key can't accept null values.	Foreign key can accept multiple null value.
By default, Primary key is clustered index and data in the database table is physically organized in the sequence of clustered index.	Foreign key do not automatically create an index, clustered or non-clustered. You can manually create an index on foreign key.
We can have only one Primary key in a table.	We can have more than one foreign key in a table.
The primary key of a particular table is the attribute which uniquely identifies every record and does not contain any null value.	The foreign key of a particular table is simply the primary key of some other table which is used as a reference key in the second table.
A primary key attribute in a table can never contain a null value.	A foreign key attribute may have null values as well.
Not more than one primary key is permitted in a table.	A table can have one or more than one foreign key for referential purposes.
Duplicity is strictly prohibited in the primary key; there cannot be any duplicate values.	Duplicity is permitted in the foreign key attribute, hence duplicate values are permitted.

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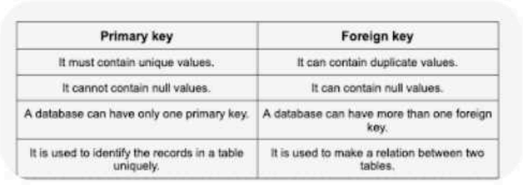
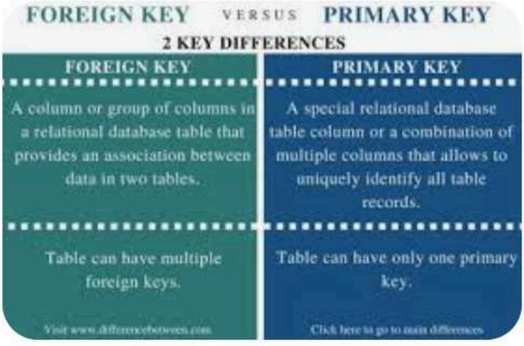


Primary key	Foreign key
It must contain unique values.	It can contain duplicate values.
It cannot contain null values.	It can contain null values.
A database can have only one primary key.	A database can have more than one foreign key.
It is used to identify the records in a table uniquely.	It is used to make a relation between two tables.

Medium

Primary Key and Foreign ...



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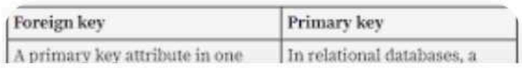

Foreign key	Primary key
A primary key attribute in one	In relational databases, a

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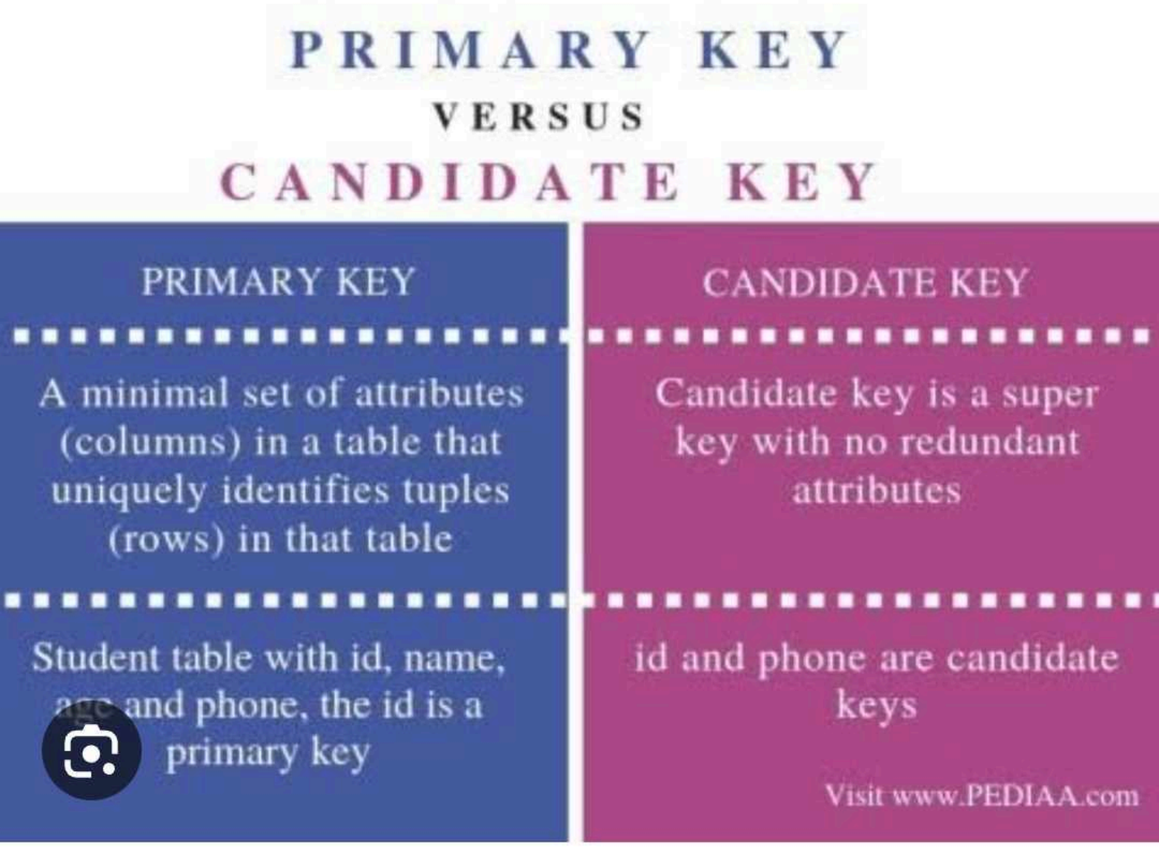

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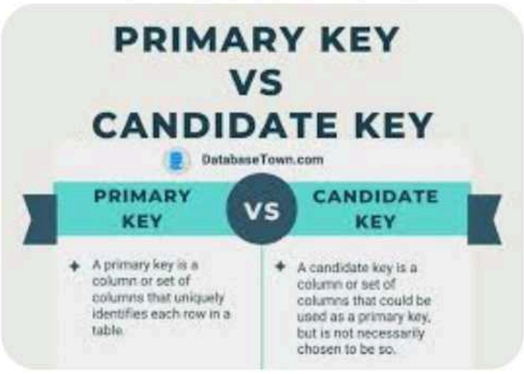

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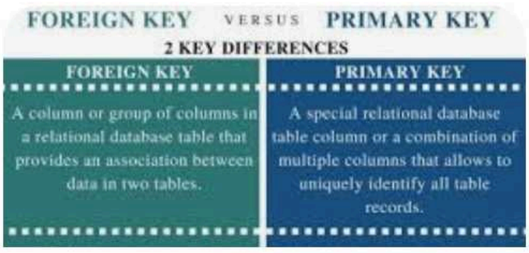

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Difference Between Candidate Key and Super

Candidate Key	Super Key
It can be a column or combination of columns which can be qualify as Unique key. A table can have more than one candidate key, but only one candidate key can be primary key.	A super key is a set or one of more columns to uniquely identify rows in a table.
Candidate key is minimal super key from which you cannot remove any fields else it will not be able to unique identify the rows. We can say that candidate key is the proper subset of super key.	Super key is any combination of columns which uniquely identify a row in the table.
While in a relation, number of candidate keys are less than number of super keys	In a relation, number of super keys are more than number of candidate keys
dddLanguage	DMLionanguage
Candidate key's attributes can also contain NULL values	Super key's attributes can contain NULL values
Candidate Key is a proper subset of a super key.	Super Key is an attribute (or set of attributes) that is used to uniquely identifies all attributes in a relation.
All candidate keys are super keys.	All super keys can't be candidate keys
Various candidate keys together makes the criteria to select the primary keys.	Various super keys together makes the criteria to select the candidate keys

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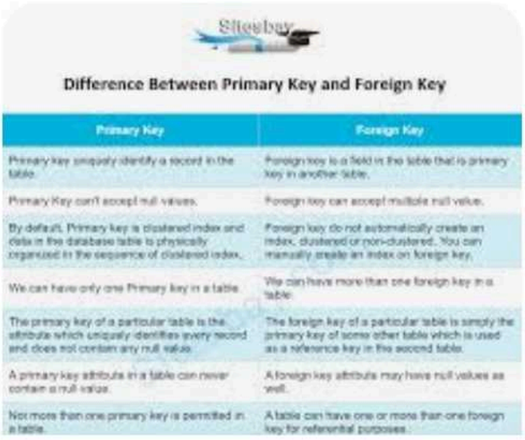

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Difference between Primary key and Super key

S.NO	SUPER KEY	PRIMARY KEY
1.	Super Key is an attribute (or set of attributes) that is used to uniquely identifies all attributes in a relation.	Primary Key is a minimal set of attribute (or set of attributes) that is used to uniquely identifies all attributes in a relation.
2.	All super keys can't be primary keys.	Primary key is a minimal super key.
3.	Various super keys together makes the criteria to select the candidate keys.	We can choose any of the minimal candidate key to be a primary key.
4.	In a relation, number of super keys are more than number of primary keys.	While in a relation, number of primary keys are less than number of super keys.
5.	Super key's attributes can contain NULL values.	Primary key's attributes cannot contain NULL values.

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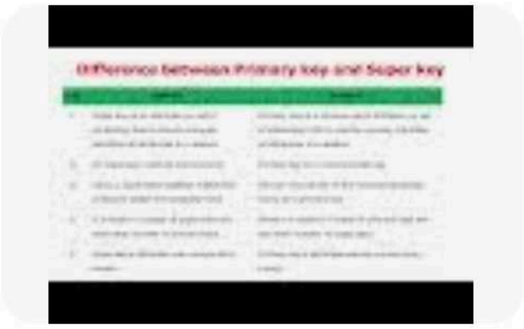

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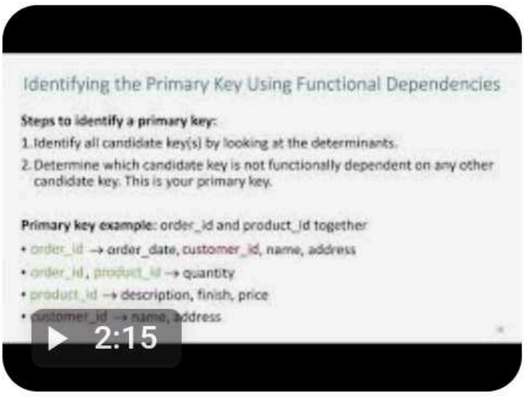

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	ER Model	Relational Model
se	Shows real-world objects, their characteristics, and the relationships between them.	Shows data about objects in tabl and how the tables relate to each other.
ry	For anyone who needs to see how the database will be formed.	Mostly for programmers who nee see where data will be stored.
age and ms	UML, Chen, Crow, and other notation types	SQL or MySQL
ponents	Entities, attributes, relationships, arrows	Tables, columns, domains, recon
	Conceptual or high-level	Representational or implementat
nships	Relationships can be easily seen through the use of arrows and symbols.	It is more difficult to determine th relationships between tables.
ng	Has the possibility to show cardinality mapping.	Not possible to see cardinality mapping

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The ER Model is a conceptual model used to design a database, while the relational schema is a logical model to create a specific database schema that can be implemented in a particular DBMS. Apr 19, 2023

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ER Model, ER Diagram and Relational

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	ER Model	Relational Model
Purpose	Shows real-world objects, their characteristics, and the relationships between them.	Shows data about objects in tables, and how the tables relate to each other.
Used by	For anyone who needs to see how the database will be formed.	Mostly for programmers who need to see where data will be stored.
Language and notations	UML, Chen, Crow, and other notation types	SQL or MySQL
Components	Entities, attributes, relationships, arrows	Tables, columns, domains, records
Type	Conceptual or high-level	Representational or implementation
Relationships	Relationships can be easily seen through the use of arrows and symbols.	It is more difficult to determine the relationships between tables.
Mapping	Has the possibility to show cardinality mapping.	Not possible to see cardinality mapping

Relational schema vs. ER diagrams: A detailed...

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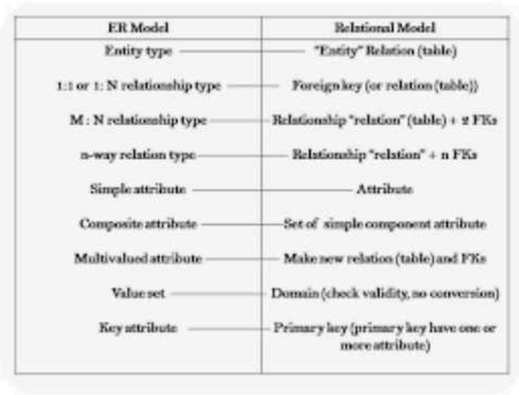

ER Model	Relational Model
Entity type	"Entity" Relation (table)
1:1 or 1: N relationship type	Foreign key (or relation (table))
M : N relationship type	Relationship "relation" (table) + 2 FKs
n-way relation type	Relationship "relation" + n FKs
Simple attribute	Attribute
Composite attribute	Set of simple component attribute
Multivalued attribute	Make new relation (table) and FKs
Value set	Domain (check validity, no conversion)
Key attribute	Primary key (primary key have one or more attribute)

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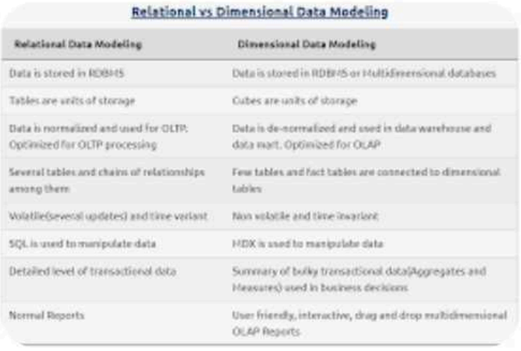
ER Diagram to Relational ...



Relational vs Dimensional Data Modeling

Relational Data Modeling	Dimensional Data Modeling
Data is stored in RDBMS	Data is stored in RDBMS or Multidimensional databases
Tables are units of storage	Cubes are units of storage
Data is normalized and used for OLTP. Optimized for OLTP processing	Data is de-normalized and used in data warehouse and data mart. Optimized for OLAP
Several tables and chains of relationships among them	Few tables and fact tables are connected to dimensional tables
Volatile(several updates) and time variant	Non volatile and time invariant
SQL is used to manipulate data	MDX is used to manipulate data
Detailed level of transactional data	Summary of bulky transactional data(Aggregates and Measures) used in business decisions
Normal Reports	User friendly, interactive, drag and drop multidimensional OLAP Reports

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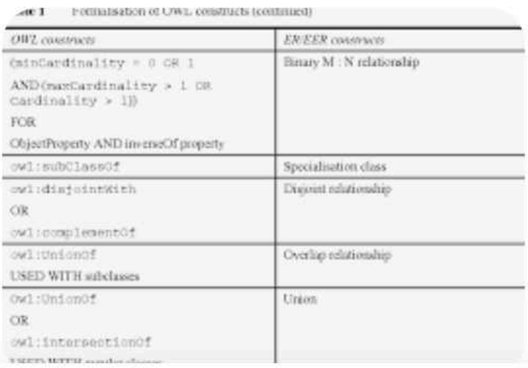
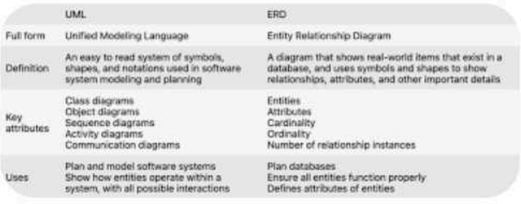


Formalisation of OWL constructs (continued)

OWL constructs	EN/EER constructs
(minCardinality = 0 OR 1 AND (maxCardinality > 1 OR Cardinality > 1)) FOR ObjectProperty AND inverseOf property	Binary M : N relationship
owl:subClassOf	Specialisation class
owl:disjointWith OR owl:complementOf	Disjoint relationship
owl:UnionOf USED WITH subclasses	Overlap relationship
owl:UnionOf OR owl:intersectionOf	Union



	UML	ERD
Full form	Unified Modeling Language	Entity Relationship Diagram
Definition	An easy to read system of symbols, shapes, and notations used in software system modeling and planning	A diagram that shows real-world items that exist in a database, and uses symbols and shapes to show relationships, attributes, and other important details
Key attributes	Class diagrams Object diagrams Sequence diagrams Activity diagrams Communication diagrams	Entities Attributes Cardinality Ordinality Number of relationship instances
Uses	Plan and model software systems Show how entities operate within a system, with all possible interactions	Plan databases Ensure all entities function properly Defines attributes of entities

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UML vs. ER diagrams: A ...

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In the context of databases, **a model is a high-level representation of the structure of a database, while a schema is a low-level representation of the same structure**. A database model provides an abstract view of the entities, attributes, and relationships between entities in a database.

Apr 19, 2023

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ER Model, ER Diagram, and Relational Schema: What's the Difference?

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What Is the Entity Relationship Model (ER Model)?

Entity-Relationship is a conceptual data model used to describe the relationships between objects in a particular domain of knowledge. In detail, the ER model is typically used to describe the structure of a database.

The ER Model consists of the following three main components:

- **Entities**: They represent objects or concepts. In a database, each table is associated with an ER entity.
- **Attributes**: The set of properties that can define an entity in the real world. In a database, they correspond to the columns on a table.
- **Relationships**. They represent the

11:25

detail, the ER model is typically used to describe the structure of a database.

The ER Model consists of the following three main components:

- **Entities**: They represent objects or concepts. In a database, each table is associated with an ER entity.
- **Attributes:** The set of properties that can define an entity in the real world. In a database, they correspond to the columns on a table.
- **Relationships**. They represent the connections between entities. In a database, they map foreign key relationships.

When it comes to databases, the ER model allows you to represent the structure of a database at a high level of

11:25

- **Relationships**. They represent the connections between entities. In a database, they map foreign key relationships.

When it comes to databases, the ER model allows you to represent the structure of a database at a high level of abstraction. In particular, this data model can be used for designing a database, providing a blueprint for implementing a database.

The ER Model is often depicted graphically using Entity-Relationship diagrams. Let's learn more about them.

What Is an Entity Relationship Diagram (ERD)?

An entity relationship diagram (ERD) is a graph based on the ER model. ER

11:25

What Is an Entity Relationship Diagram (ERD)?

An entity relationship diagram (ERD) is a graph based on the ER model. ER diagrams can be used to visually represent the structure of a database. Thus, the purpose of an ERD is to help stakeholders understand how entities in a database are related to each other.

In an ERD, the three ER main components are visually depicted as below:

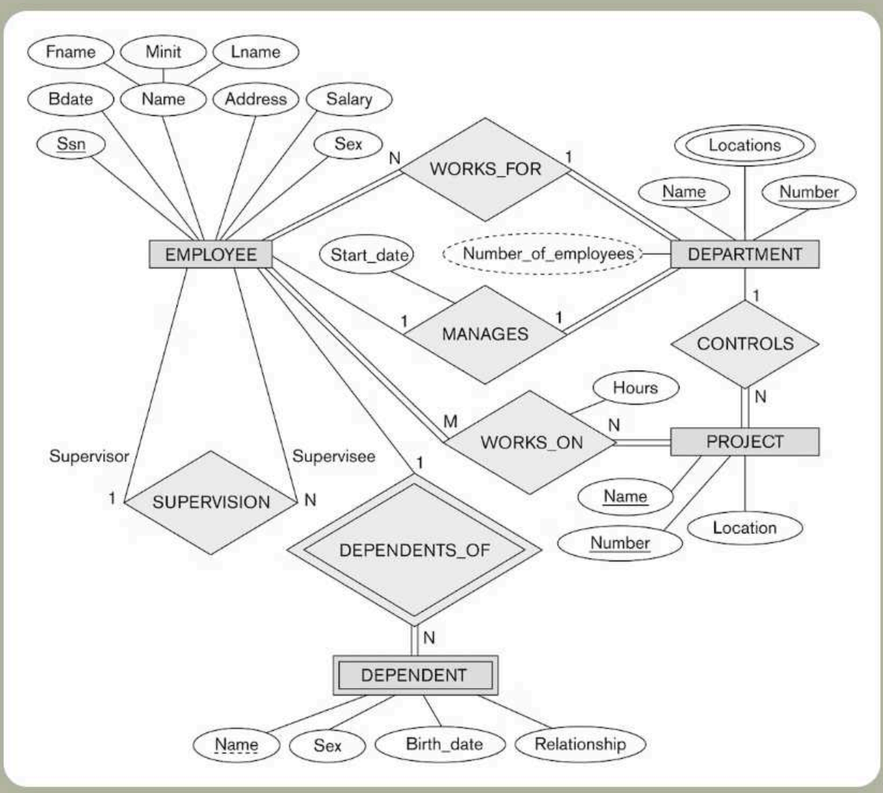
- **Entities:** Represented as rectangles, with the entity name written inside the rectangle.
- **Attributes:** Represented as ovals or circles connected to the entity with a line.
- **Relationships** Represented as

11:26

a line.

- **Relationships** Represented as diamonds, connected to the entities with lines.

Even though there are several notations accepted to represent ER, this is what an ER diagram may look like:



↑ The ER model in action in an example diagram

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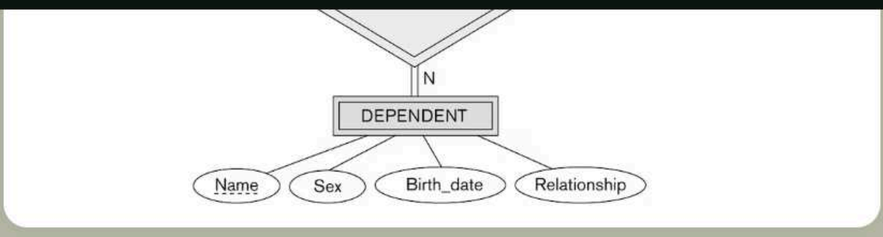

↑ The ER model in action in an example diagram

As you can see, ERDs show the entities as boxes and the relationships between them as lines connecting the boxes. Such representation makes it easy to identify design issues or inconsistencies. Thus, entity-relationship diagrams help to develop more accurate and efficient database schemas.

Let's now take a closer look at what a relational schema is.

What Is a Relational Schema?

11:26

What Is a Relational Schema?

A relational schema is a data model for logically representing the structure of a database. A relational schema is a type of database schema specifically designed to represent relational databases. Relational schemas can have a name and consists of the three main components below:

- **Relations:** In a relational schema, they are called tables.
- **Attributes:** Each attribute has a domain that specifies the type of data or limits the value an attribute can take. Each table can have many attributes. In a relational schema, they are the columns of a table.
- **Tuples:** They can be seen as instances of an entity. Each table can have several instances. In a

11:26 ··· 83

- **Tuples:** They can be seen as instances of an entity. Each table can have several instances. In a relational schema, they are the rows contained in a table.

A relational database definition is a collection of named relations, each with its attributes and tuples. In a relational schema, an attribute can also be a key:

- **A primary key** represents the identifying attribute of each instance of a table. It cannot be NULL or accept duplicate values.
- **A foreign key** links two tables in a relationship. It contains a value that references the primary key of another table. It can be a single attribute or a set of attributes.

You now know what the ER model is, and what ER diagrams and relational

11:26 83

identifying attribute of each instance of a table. It cannot be NULL or accept duplicate values.

- **A foreign key** links two tables in a relationship. It contains a value that references the primary key of another table. It can be a single attribute or a set of attributes.

You now know what the ER model is, and what ER diagrams and relational database schemas are. Let's try to understand the difference between the three concepts.

ER Model vs. ER Diagram

The ER model is a data model used to logically represent and describe relationships between real-world entities or concepts, typically when designing a database. On the other

11:26

ER Model vs. ER Diagram

The ER model is a data model used to logically represent and describe relationships between real-world entities or concepts, typically when designing a database. On the other hand, an ER diagram is a visual representation of the ER Model that relies on boxes, symbols, and connectors. Both the ER model and ER diagrams work at a high level of abstraction and are independent of the DBMS technology.

In other words, the ER model is the abstract representation of a database structure, while the ER diagram is the visual representation of the ER model. ER diagrams are used to explain and communicate the ER model to others.

logically represent and describe relationships between real-world entities or concepts, typically when designing a database. On the other hand, an ER diagram is a visual representation of the ER Model that relies on boxes, symbols, and connectors. Both the ER model and ER diagrams work at a high level of abstraction and are independent of the DBMS technology.

In other words, the ER model is the abstract representation of a database structure, while the ER diagram is the visual representation of the ER model. ER diagrams are used to explain and communicate the ER model to others. Thus, you can use an ER diagram to convey your idea of an ER model.

11:27 ··
83

ER Model vs. Relational Schema

The ER model is a conceptual model that defines the entities in a database, the attributes they consist of, and the relationships between them. The entity-relationship model is used to design the overall structure of a database and serves as a blueprint of a database. On the other hand, the relational schema is a logical data model that represents the structure of a database at a lower level. It is used to define a database schema that can be implemented with a particular DBMS. So, a relational schema depends on the features and characteristics offered by the DBMS chosen.

Simply put, the ER model and the relational schema are both used to

particular DBMS. So, a relational schema depends on the features and characteristics offered by the DBMS chosen.

Simply put, the ER model and the relational schema are both used to represent the structure of a database. Yet, they have different purposes and different levels of abstraction. The ER Model is a conceptual model used to design a database, while the relational schema is a logical model to create a specific database schema that can be implemented in a particular DBMS.

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key in DBMS

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A key in DBMS is **an attribute or a set of attributes that help to uniquely identify a tuple (or row) in a relation (or table)**. Keys are also used to establish relationships between the different tables and columns of a relational database. Individual values in a key are called key values. Oct 3, 2022

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dbms মধ্যে tuple

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A tuple, also known as a record or row, is **a basic unit of data in a relational database management system (DBMS)**. A tuple represents a single instance of a relation, or table, in the database. Each tuple contains a set of values, or attributes, that correspond to the columns, or fields, of the relation.

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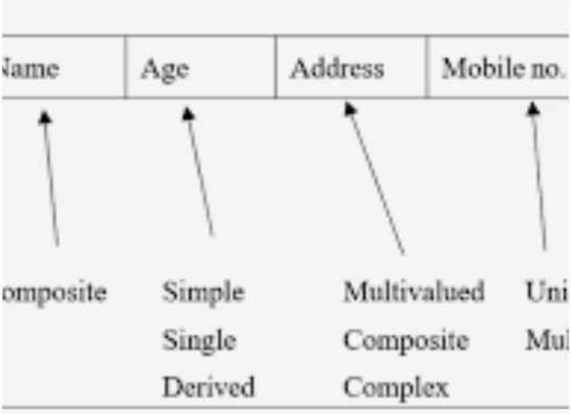

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Attributes in DBMS are **represented by elliptical shapes**. An entity may contain any number of attributes while one of the attributes is considered to be a primary key attribute. There are different types of attributes in DBMS: Simple, Composite, Single Valued, Multi-Valued, Stored, Derived, Key, and Complex attributes.

https://www.scaler.com › topics › ty...

Types of Attributes in DBMS - Scaler

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mode vs schema in DBMS

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In the context of databases, **a model is a high-level representation of the structure of a database, while a schema is a low-level representation of the same structure**. A database model provides an abstract view of the entities, attributes, and relationships between entities in a database.

Apr 19, 2023

https://www.dbvis.com › thetable

ER Model, ER Diagram, and Relational Schema: What's the Difference?

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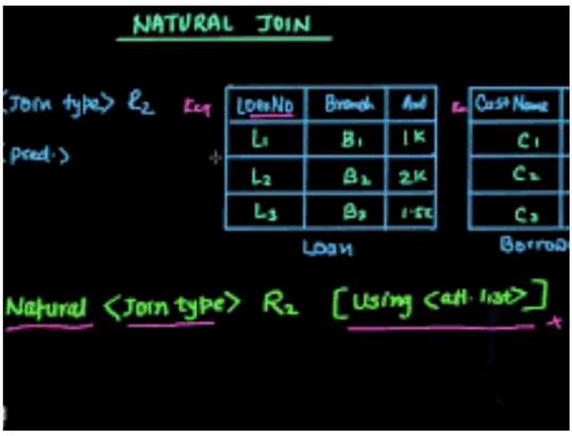

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A NATURAL JOIN is **a JOIN operation that creates an implicit join clause for you based on the common columns in the two tables being joined**. Common columns are columns that have the same name in both tables. A NATURAL JOIN can be an INNER join, a LEFT OUTER join, or a RIGHT OUTER join. The default is INNER join.

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Cartesian join in DBMS

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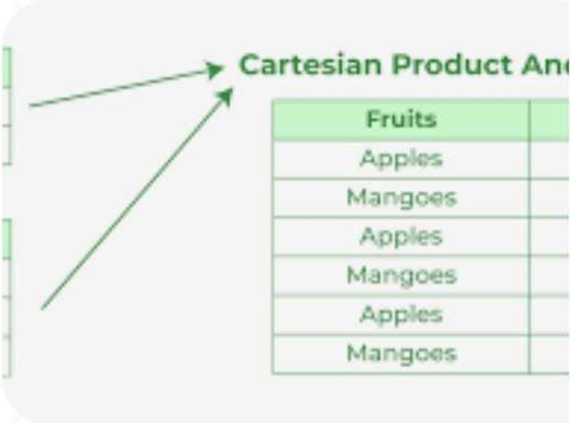

URSE_ID	ROLL_N
1	1
2	2
2	3
3	4

বাংলায় | In English

CARTESIAN JOIN: The CARTESIAN JOIN is also known as CROSS JOIN. In a CARTESIAN JOIN **there is a join for each row of one table to every row of another table**. This usually happens when the matching column or WHERE condition is not specified. Sep 11, 2023

https://www.geeksforgeeks.org › sql...

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rename operation in dbms

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Rename Operation:

The rename operation is **used to rename the output relation**. It is denoted by rho (ρ). Example: We can use the rename operator to rename STUDENT relation to STUDENT1.

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বাংলায় | In English

The rename operator ρ is one of the unary operators in relational algebra and is used to rename relations in a DBMS. In other words, some relations or attributes may have complex names and can be changed to make writing queries easier.

https://www.educative.io › answers

What is the rename operator in DBMS? - Educative.io

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$\sigma_{dept='ICE'}$ (NSTU)

$\sigma_{dept='ICE' \wedge salary \geq 20000 \wedge salary \leq 40000}$ (NSTU)

$\sigma_{dept_name, Avgs}$ ($_{dept_name}\mathcal{G}_{avg(salary)\ as\ avgs}$ (NSTU)) $(Avgs > 3000)$

$\sigma_{instructor_id}$ (σ

$\mathcal{G}_{count\ distinct\ (ID)}$ ($\sigma_{instructor_id = "18012OM}$ (NSTU))

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set difference operation in...

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বাংলায় | In English

The set difference operators **takes the two sets and returns the values that are in the first set but not the second set.** Jun 19, 2020

https://www.tutorialspoint.com › Re...

Relational Set Operators in DBMS - Tutorialspoint

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Student

S_id	Name	Class	Age	C_type
1	Andrew	5	25	A
2	Angel	10	30	A
3	Anamika	8	35	C

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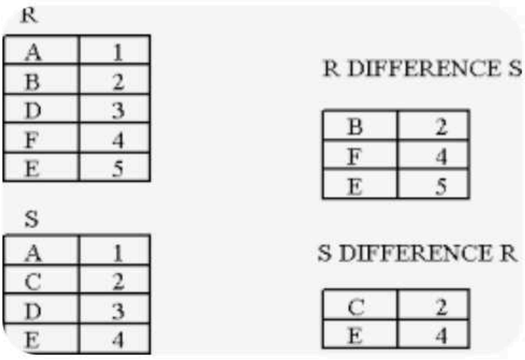


R

A	1
B	2
D	3
F	4
E	5

S

A	1
C	2
D	3
E	4

R DIFFERENCE S

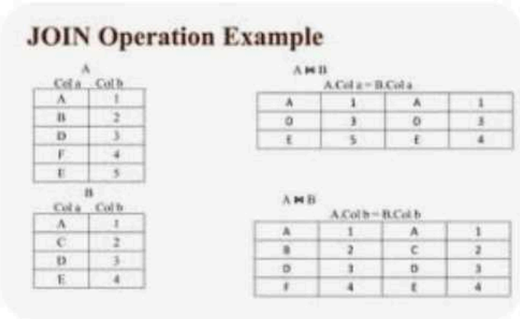
B	2
F	4
E	5

S DIFFERENCE R

C	2
E	4

db.grussell.org

Relational Algebra



JOIN Operation Example

A

Col a	Col b
A	1
B	2
D	3
F	4
E	5

B

Col a	Col b
A	1
C	2
D	3
E	4

A ⋈ B

A.Col a = B.Col a

A	1	A	1
D	3	D	3
E	5	E	4

A ⋈ B

A.Col b = B.Col b

A	1	A	1
B	2	C	2
D	3	D	3
F	4	E	4

SlideShare

R

ColA	ColB
A	1
B	2
D	3
F	4
E	5

S

SColA	SColB
A	1
C	2
D	3
E	4

R JOIN R.ColA = S.SColA

A	1	A	1
D	3	D	3
E	5	E	4

R JOIN R.ColB = S.SColB

A	1	A	1
B	2	C	2
D	3	D	3
F	4	E	4

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outer join operation in dbms

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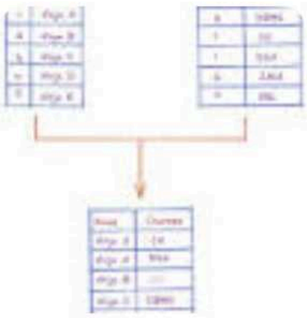

Outer join in DBMS is **based on Matched and Unmatched Data Values**. It retrieves all values from both tables that meet the join conditions. In other words, the outer join can return all rows from one or both tables in addition to the matching values. Sep 11, 2023

https://www.codingninjas.com › intr...

SQL Outer Join - Coding Ninjas

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left outer join operation in...

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The Left-Outer Join is **an outer join that returns all the values of the left table, and the values of the right table that has matching values in the left table**. If there is no matching result in the right table, it will return null values in that field. Mar 21, 2020

https://afteracademy.com › blog

What is Join in DBMS and what are its types? - AfterAcademy

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A right outer join is **a method of combining tables**. The result includes unmatched rows from only the table that is specified after the RIGHT OUTER JOIN clause. If you are joining two tables and want the result set to include unmatched rows from only one table, use a LEFT OUTER JOIN clause or a RIGHT OUTER JOIN clause.

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Right outer join - Application programming and SQL - IBM

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An full outer join is **a method of combining tables so that the result includes unmatched rows of both tables**. If you are joining two tables and want the result set to include unmatched rows from both tables, use a FULL OUTER JOIN clause. The matching is based on the join condition.

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renaming operation in dbms

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Rename Operation:

The rename operation is **used to rename the output relation**. It is denoted by rho (ρ). Example: We can use the rename operator to rename STUDENT relation to STUDENT1.

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RENAME (ρ) Operation in Relational Algebra

Oct 5, 2020 — The RENAME operation is used to rename the output of a relation. Sometimes it is simple and

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This relational operator is a base for SQL (Structured Query Language) and is used to rename relations.

Syntax

A rename query looks like the following:

$$\rho_{new_relation_name(new_attribute_name_list)}(R)$$

The $new_relation_name$ contains the name we want to replace with the original relation R and the $new_attribute_name_list$ contains the changed attribute names of R.

Why is it needed?

The following are some reasons to use the rename operator:

- It helps us have user-friendly names so that it is easy to understand.

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Rename operator

The **rename operator** ρ is one of the unary operators in relational algebra and is used to rename relations in a DBMS. In other words, some relations or attributes may have complex names and can be changed to make writing queries easier.

This relational operator is a base for SQL (Structured Query Language) and is used to rename relations.

Syntax

A rename query looks like the following:

$$\rho_{new_relation_name(new_attribute_name_list)}(R)$$

The $new_relation_name$ contains the name we want to replace with the

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Log In Join

Types

Three following types of renaming can be done:

- Renaming a relation
- Renaming an attribute
- Renaming both

Let's look at the differences between them using examples:

Rename a relation

Suppose we have a relation named $Students$ and we want to change it to $FinalYrStudents$, the rename operation works as follows:

$$\rho_{FinalYrStudents}(Students)$$

Rename an attribute

Suppose we have a relation named Students and we want to change its

12:54

Log In Join

$$\rho_{FinalYrStudents}(Students)$$

Rename an attribute

Suppose we have a relation named Students and we want to change its attributes $StudentID$, $StudentName$ to SID and $SName$, the rename operation works as follows:

$$\rho_{(SID,SName)}(Students)$$

The attributes will be ordered as same as the tables and must be renamed in the same order. If only selective attributes are to be changed, rewrite the original attribute names of those that are supposed to be unchanged.

Rename both

Next, we'll change both the relation name and attributes of the $Students$ class:

$$\rho_{FinalYrStudents(SID,SName)}(Students)$$

12:54

are to be changed, rewrite the original attribute names of those that are supposed to be unchanged.

Rename both

Next, we'll change both the relation name and attributes of the $Students$ class:

$$\rho_{FinalYrStudents(SID,SName)}(Students)$$

Conclusion

Once relations and attributes are renamed, they can be used in the projection and selection operations to access the relations.

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Zainab Ilyas

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Physical Data Independence is defined as **the ability to make changes in the structure of the lowest level of the Database Management System (DBMS) without affecting the higher-level schemas**. Hence, modification in the Physical level should not result in any changes in the Logical or View levels. Dec 24, 2021

https://www.geeksforgeeks.org › ph...

Physical and Logical Data Independence - GeeksforGeeks

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Atomicity problem: Atomicity in dbms, ensures that the transaction is either fully completed or fully rolled back to the state it was in before the transaction began. Example:
Bank transactions.

concurrent-access anomalies: concurrent access to data means more than one user is accessing the same data at the same time. Anomalies occur when changes made by one user get lost because of changes made by another user.

Security problem: file processing system does not provide adequate security
→ mining
on data. For example, a data entry