3. What are Databases?

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A Database is a shared collection of logically related data and description of these data, designed to meet the information needs of an organization

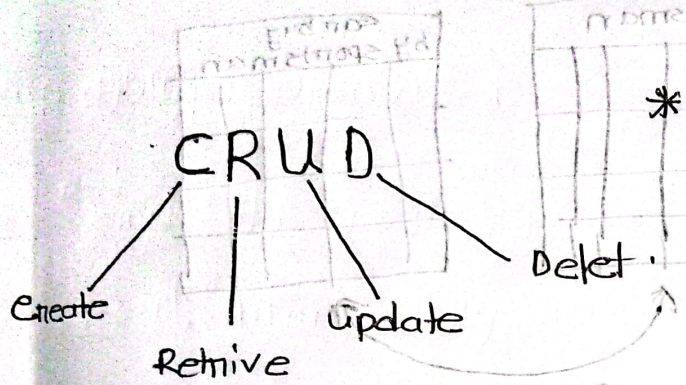
Data Storage: A database is used to store large amounts of structured data, making it easily accessible, searchable, and retrievable.

Data Analysis: A database can be used to perform complex data analysis, generate reports, and provide insights into the data.

Record Keeping: A database is often used to keep track of important records, such as financial transactions, customer information, and inventory levels.

Web Applications: Databases are an essential component of many web applications, providing dynamic content and user management.

Database Fundamentals



* Databases are basically a software which is logically store and organize data so that in future i can retrive it for my need.

* Properties of an ideal Database.

1. Integrety : accurate accuracy + consitency
2. Availability : Always available.
3. Security : Every person conected in the world online
4. Independ of Application : Android / ios / computer /
5. Concurrency : Parallaly serve

5. Types of Databases

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1. **Relational Databases -**
   Also known as SQL databases, these databases use a relational model to organize data into tables with rows and columns.

2. **NoSQL Databases -**
   These databases are designed to handle large amounts of unstructured or semi-structured data, such as documents, images, or videos. (MongoDB)

3. **Column Databases -**
   These databases store data in columns rather than rows, making them well-suited for data warehousing and analytical applications. (Amazon Redshift, Google BigQuery)

4. **Graph Databases -**
   These databases are used to store and query graph-structured data, such as social network connections or recommendation systems. (Neo4j, Amazon Neptune)

5. **Key-value databases -**
   These databases store data as a collection of keys and values, making them well-suited for caching and simple data storage needs (Redis and Amazon DynamoDB)

R·D

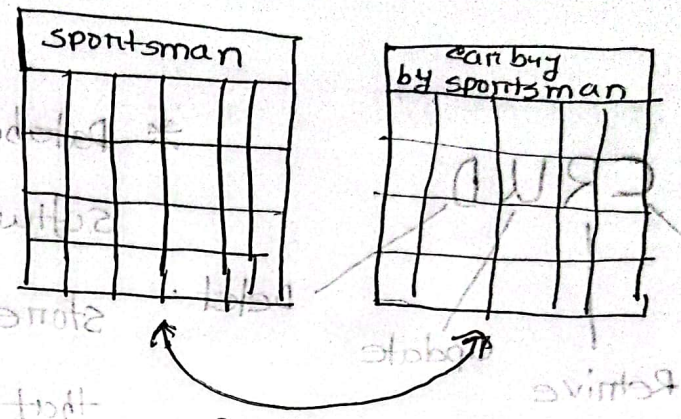
S	CE	2021
A	CSE	2023

in memory: S CE 2021 | A CSE 2023

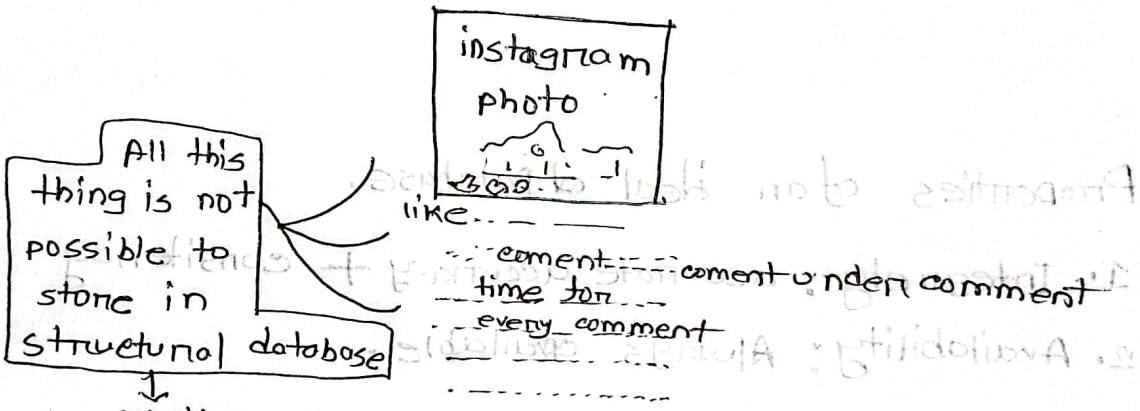
(store data row form)

① Relational Database:

- Mysql
- postgre
- oracle
- sql server
- Microsoft access.



② NoSQL Database: (MongoDB)



③ column Database:

S	CE	2021
A	CSE	2022
J	ME	2023

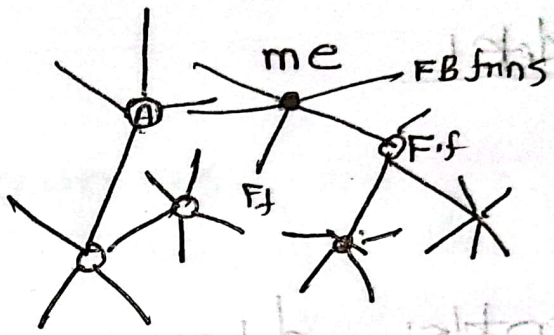
Data Analyst mostly use

in memory:

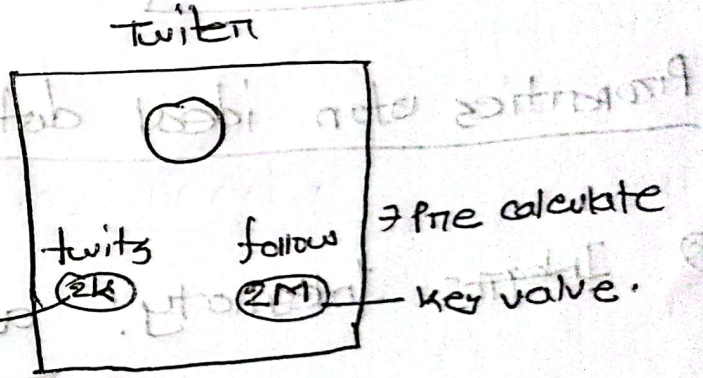
S A J | CE CSE ME | 2021 2022 2023

④ Graph database: complex relation

Facebook use it ~~(verify spc.~~



⑤ key - value - database:



6. Relational Databases

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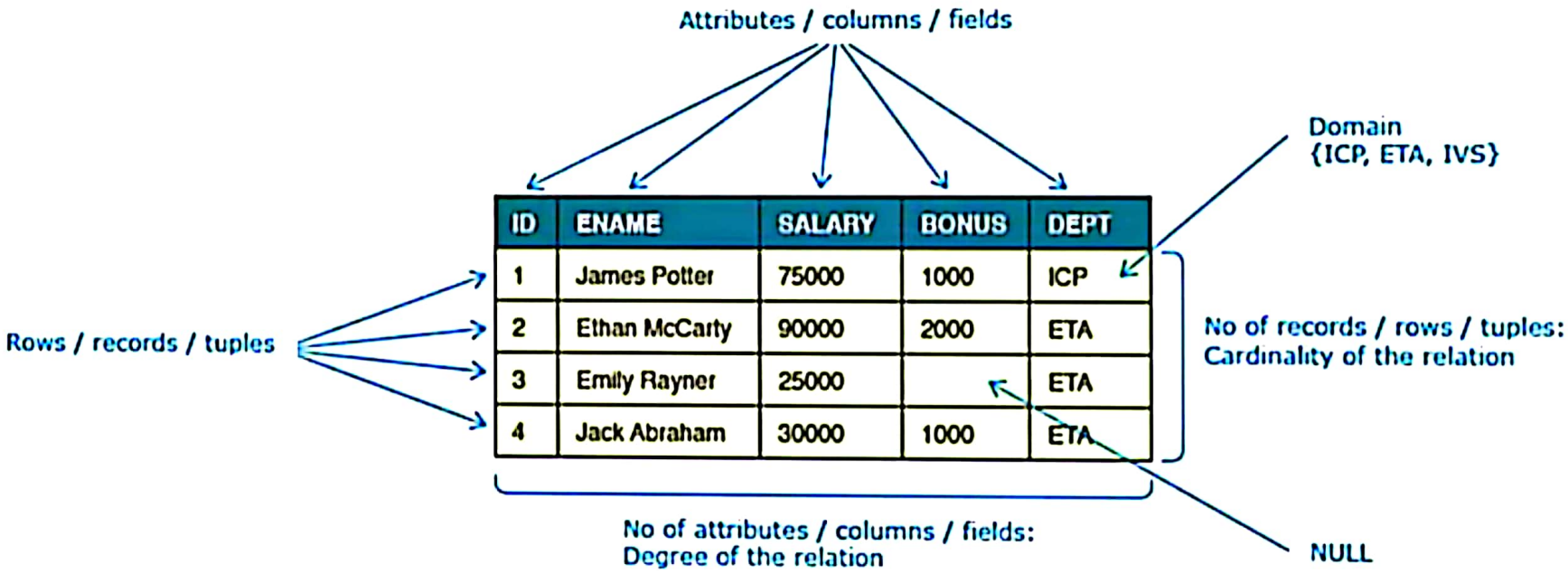
Also known as SQL databases, these databases use a relational model to organize data into tables with rows and columns.



ID	ENAME	SALARY	BONUS	DEPT
1	James Potter	75000	1000	ICP
2	Ethan McCarty	90000	2000	ETA
3	Emily Rayner	25000		ETA
4	Jack Abraham	30000	1000	ETA

Relation is usually represented as:
Employee(ID, ENAME, SALARY, BONUS, DEPT)

Relational database:

Relation = Table

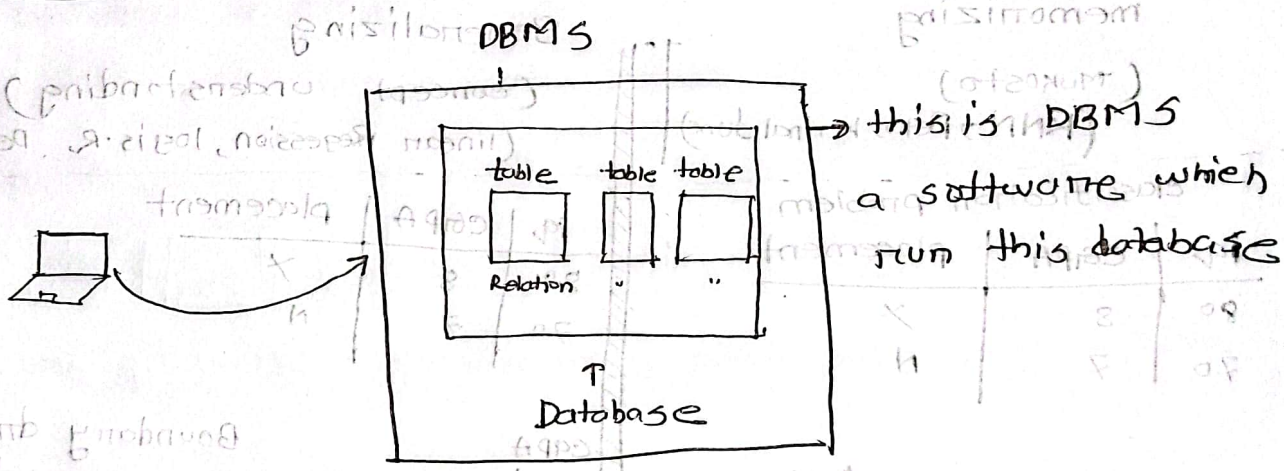
Column = Attribute

row = tuple/ records

Number of column = degree of relation

Number of row = Cardinality of the relation.

* DBMS:



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database store data in harddrive/ssd

User → DBMS → Database → Harddrive

7. What is a DBMS

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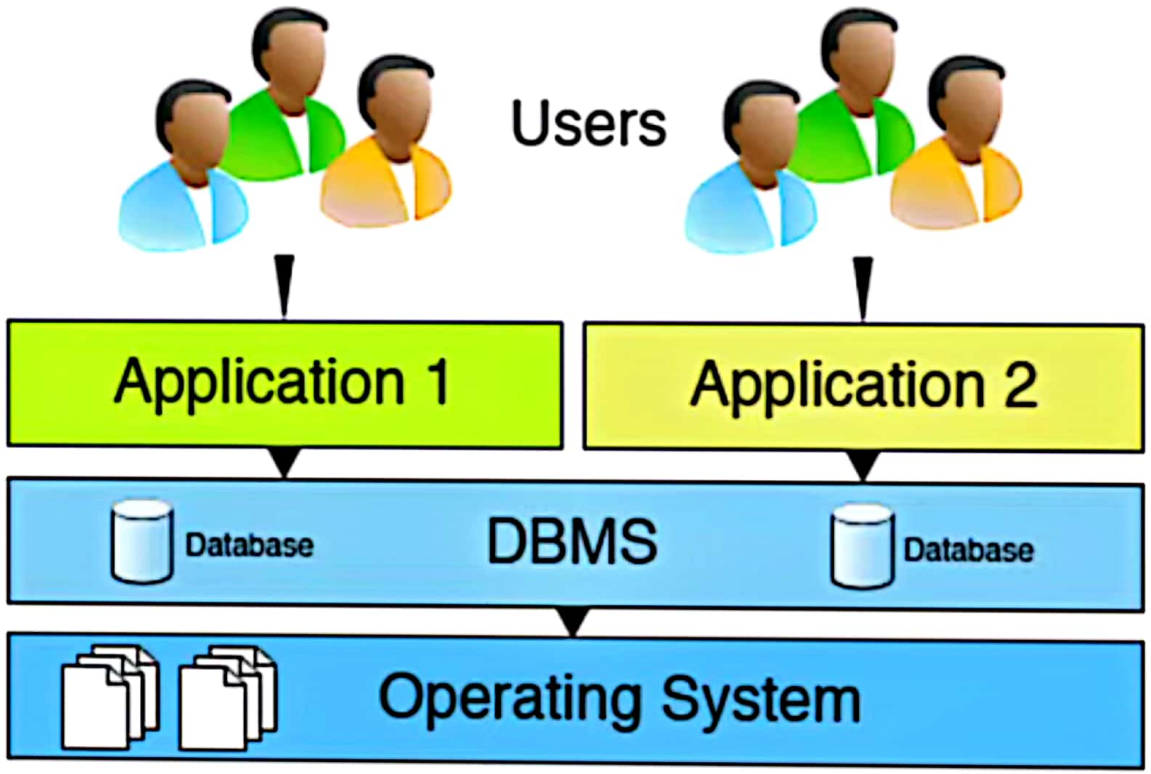
A database management system (DBMS) is a software system that provides the interfaces and tools needed to store, organize, and manage data in a database. A DBMS acts as an intermediary between the database and the applications or users that access the data stored in the database.



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Functions of DBMS

Data Management - Store, retrieve and modify data

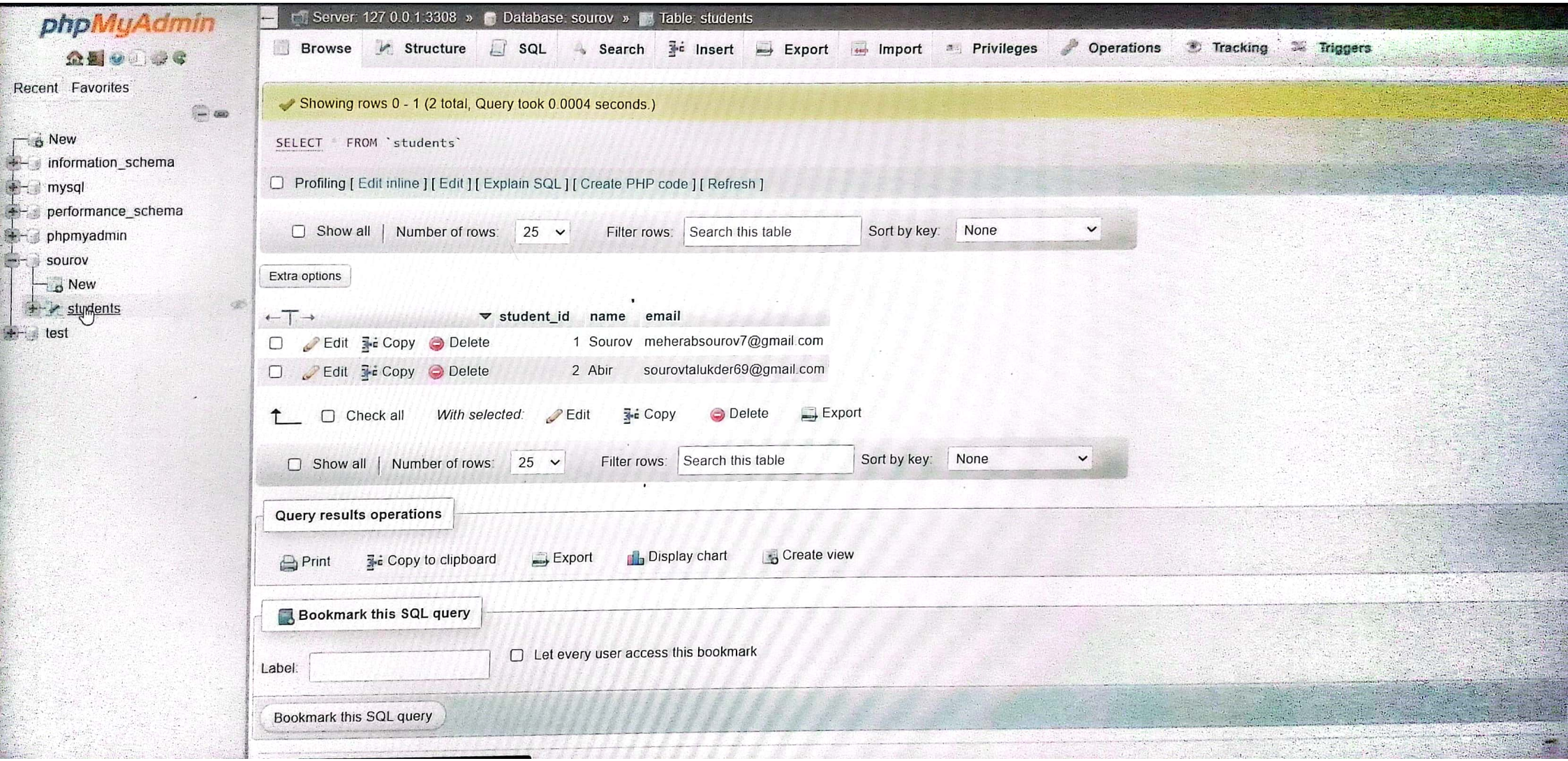
Integrity - Maintain accuracy of data

Concurrency - Simultaneous data access for multiple users

Transaction - Modification to database must either be successful or must not happen at all

Security - Access to authorized users only

Utilities - Data import/export, user management, backup, logging


phpMyAdmin
Recent Favorites
New
information_schema
mysql
performance_schema
phpmyadmin
sourov
New
students
test
Server: 127.0.0.1:3308 » Database: sourov » Table: students
Browse Structure SQL Search Insert Export Import Privileges Operations Tracking Triggers
Showing rows 0 - 1 (2 total, Query took 0.0004 seconds.)
SELECT * FROM `students`
Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh]
Show all | Number of rows: 25 Filter rows: Search this table Sort by key: None
Extra options
student_id name email
Edit Copy Delete 1 Sourov meherabsourov7@gmail.com
Edit Copy Delete 2 Abir sourovtalukder69@gmail.com
Check all With selected: Edit Copy Delete Export
Show all | Number of rows: 25 Filter rows: Search this table Sort by key: None
Query results operations
Print Copy to clipboard Export Display chart Create view
Bookmark this SQL query
Label:
Let every user access this bookmark
Bookmark this SQL query

10. Database Keys

06 February 2023 17:07

A key in a database is an attribute or a set of attributes that uniquely identifies a tuple (row) in a table. Keys play a crucial role in ensuring the integrity and reliability of a database by enforcing unique constraints on the data and establishing relationships between tables.

Roll no	Name	Branch	Email
1	Nitish Singh	CSE	nitish@gmail.com
2	Ankit Sharma	EEE	ankit@gmail.com
3	Neha Verma	ME	neha@gmail.com

1. **Super Key** -
   A Super key is a combination of columns that uniquely identifies any row within a relational database management system (RDBMS) table

2. **Candidate key** -
   A candidate key is a minimal Super key, meaning it has no redundant attributes. In other words, it's the smallest set of attributes that can be used to uniquely identify a tuple (row) in the table

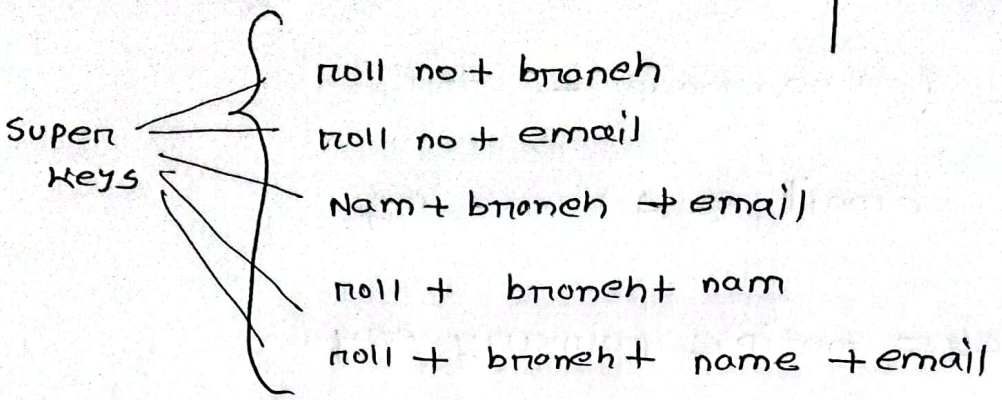
3. **Primary Key** -
   A primary key is a unique identifier for each tuple in a table. There can only be one primary key in a table, and it cannot contain null values.

4. **Alternate Key** -
   An alternate key is a candidate key that is not used as the primary key.

5. **Composite Key** -
   A composite key is a primary key that is made up of two or more attributes. Composite keys are used when a single attribute is not sufficient to uniquely

① * Super key: roll no + Name

Key colums are
roll number, email



② Candiate key: roll number ✓
email ✓

(one can handle for uniquely identity)

roll + Nam - ✗ (because roll is already candidate it can handle)

Roll + emal ✗ (" email " " " " ")

③ Primary key:

Criteria

* can't be null.
* non repeated and non duplicated.
* good to have.
  (i) Numerical
  (ii) small
  (iii) Constant

roll number
emal → election: who is win it will primary.

They This are taken one special key from candidate key.

The election is based on this criterias. sofinally according to condition roll number is win. That mean the roll no is primary key.

④ Alternate key = candidate key − primary key

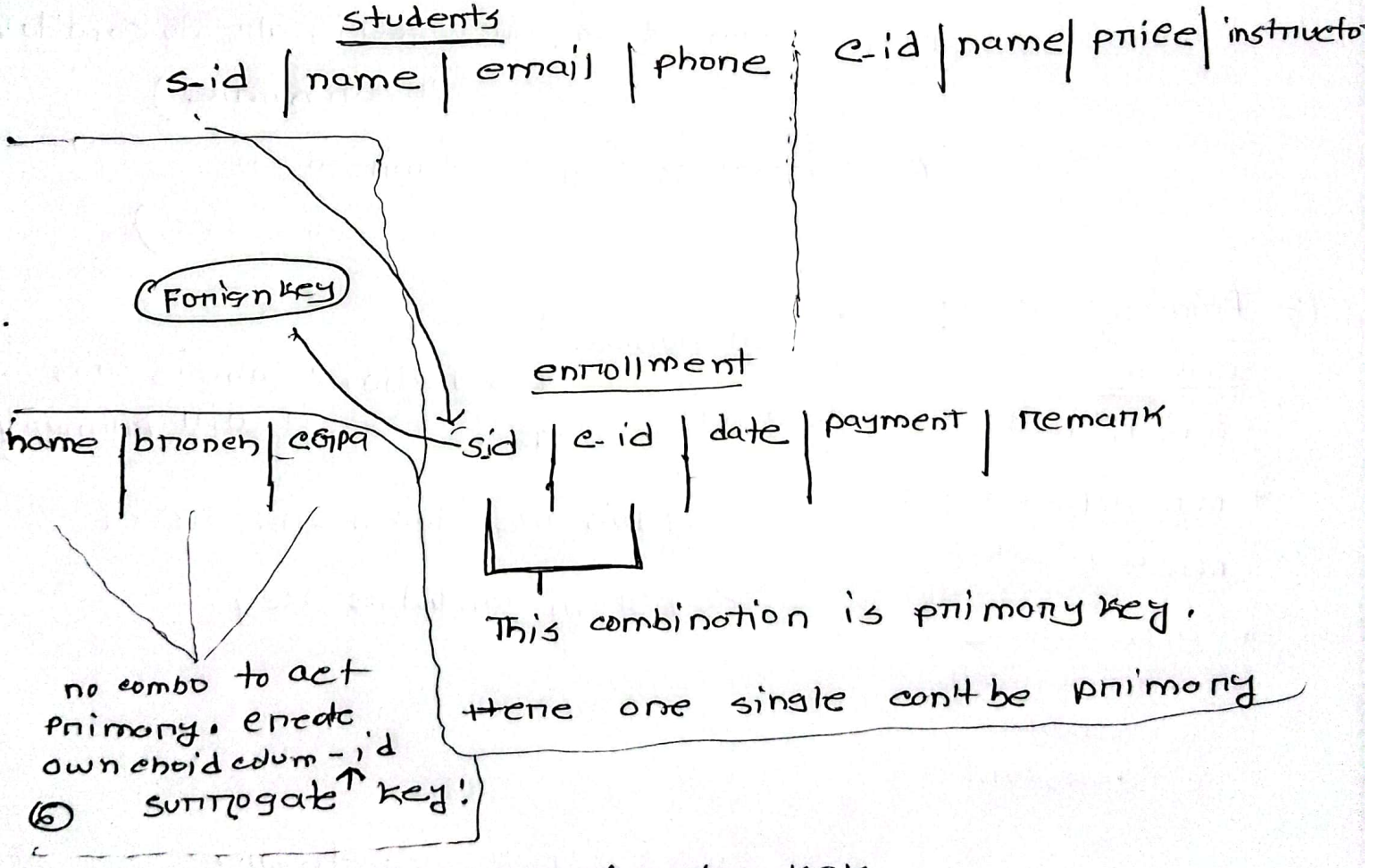
= (roll no, email) − roll

= email ⇐ Alternate key

⑤ composite key = mutiple primary key.

= Primary key + primary key

Suppose in udemy



⑦ Foreign key: s-id i foreign key

11. Cardinality of Relationships

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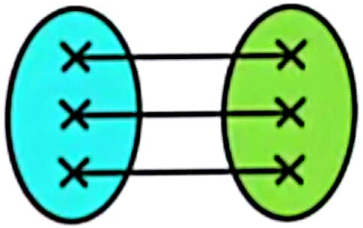
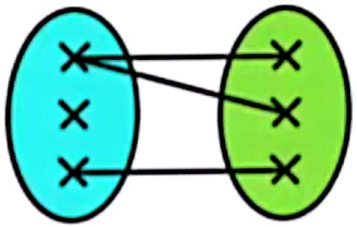
Cardinality in database relationships refers to the number of occurrences of an entity in a relationship with another entity. Cardinality defines the number of instances of one entity that can be associated with a single instance of the related entity.



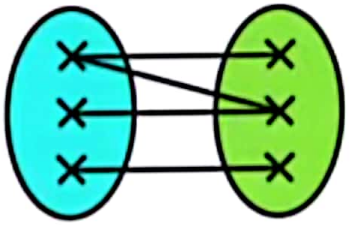
1:1

One-to-one relationship



1:N

One-to-many relationship



M:N

Many-to-many relationship

Examples

1. Person -> Driving License Number
2. Student -> college branch
3. Restaurants -> orders
4. Restaurants -> menu
5. Students -> courses

* Cardinality Relationship:

entity : students, department

↓

which can table make

* There are three types of relationship.

* (i) 1 to one relationship: one guy with his driving licence. (driving licence man can one)
(just need one table)

(ii) 1 to many : In college on banonen have multiple students, one resturont many order.
(need 2 tables)

(iii) Many to many : udemy. students, and courses.
(3 tables) one student can enroll in multiple courses. on course have multiple students.

12. Drawbacks of Databases

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Complexity: Setting up and maintaining a database can be complex and time-consuming, especially for large and complex systems.

Cost: The cost of setting up and maintaining a database, including hardware, software, and personnel, can be high.

Scalability: As the amount of data stored in a database grows, it can become more difficult to manage, leading to performance and scalability issues.

Data Integrity: Ensuring the accuracy and consistency of data stored in a database can be a challenge, especially when multiple users are updating the data simultaneously.

Security: Securing a database from unauthorized access and protecting sensitive information can be difficult, especially with the increasing threat of cyber attacks.

Data Migration: Moving data from one database to another or upgrading to a new database can be a complex and time-consuming process.

Flexibility: The structure of a database is often rigid and inflexible, making it difficult to adapt to changing requirements or to accommodate new types of data.