

Database Management System

Unit 1

① Difference between data and information?

Data	Information
Data is a raw facts and figures.	Information is processed data.
Data is not arranged.	Information is arranged.
Data is unorganized	Information is organized
Data is not so meaningful.	Information is meaningful.
Data is input.	information is output
Data does not directly helps in decision making.	Information directly helps in decision making.
eg Rajesh, 27, Nepal	Rajesh is a 28 years old student from Nepal

② Define Database with example?

A database is a collection of an interrelated data in an organized manner, so that data can be easily accessed and managed. Database is a digital filing system where information is arranged in a way that makes it simple to find and use. There are various examples of Database.

Telephone directory and Dictionary are the examples of Database.

- Telephone Directory stores contact numbers
- Dictionary stores words meaning.

Database is a collection of an organized data that can be easily accessed, managed, and updated.
Example.

A library database stores book details like book titles, authors, and ISBNs.

Book ID	Title	Authors	ISBN
1	Database system	XYZ	1234
2	C program	ABC	6789

What is DBMS? List out the advantages and disadvantages of DBMS.

Database management system (DBMS) is a software that allows users to create, define and manipulate database. DBMS provides an interface to perform various operations like creating database, storing data in it, updating data, creating tables in the database and a lot more.

A program or a group of programs used to manage a database is called dbms. DBMS is application software.

DBMS enable us to share database among the users.

The examples of DBMS applications are MS Access, MySQL, Oracle, MongoDB, SQL server... etc.

The advantages of DBMS are

- ① Data sharing :- multiple users can share data at the same time.
- ② Data centralization :- All data is stored in one place.

- (iii) Reduced Data Redundancy:- minimized duplicate data.
- (iv) Data Integrity:- Ensures accuracy and consistency of data.
- (v) Data Security:- protects from unauthorized access.
- (vi) Backup and Recovery:- provide automatic backups for future in case of failure. prevents data loss.
- (vii) flexibility and scalability:- Easy to add or modify data.

Disadvantages of DBMS are:-

- (i) Complexity and cost:- Requires skilled persons to use and are expensive software and hardware devices.
- (ii) power dependency:- Requires consistent power supply.
- (iii) performance issues:- performance may not work as fast as desired, when dealing with large volumes of data.
- (iv) Maintenance costs:- Regular updates, security patches, and technical support add to the overall cost.
- (v) potential for Data Loss:- system failures, hardware issues can lead to data corruption or loss, especially if backups are not maintained regularly.

Q1 Define Database Languages and Explain its types 4

Database Languages:-

Database Languages are the commands or interfaces to interact with database. Query is a way by which we can communicate with database or database objects.

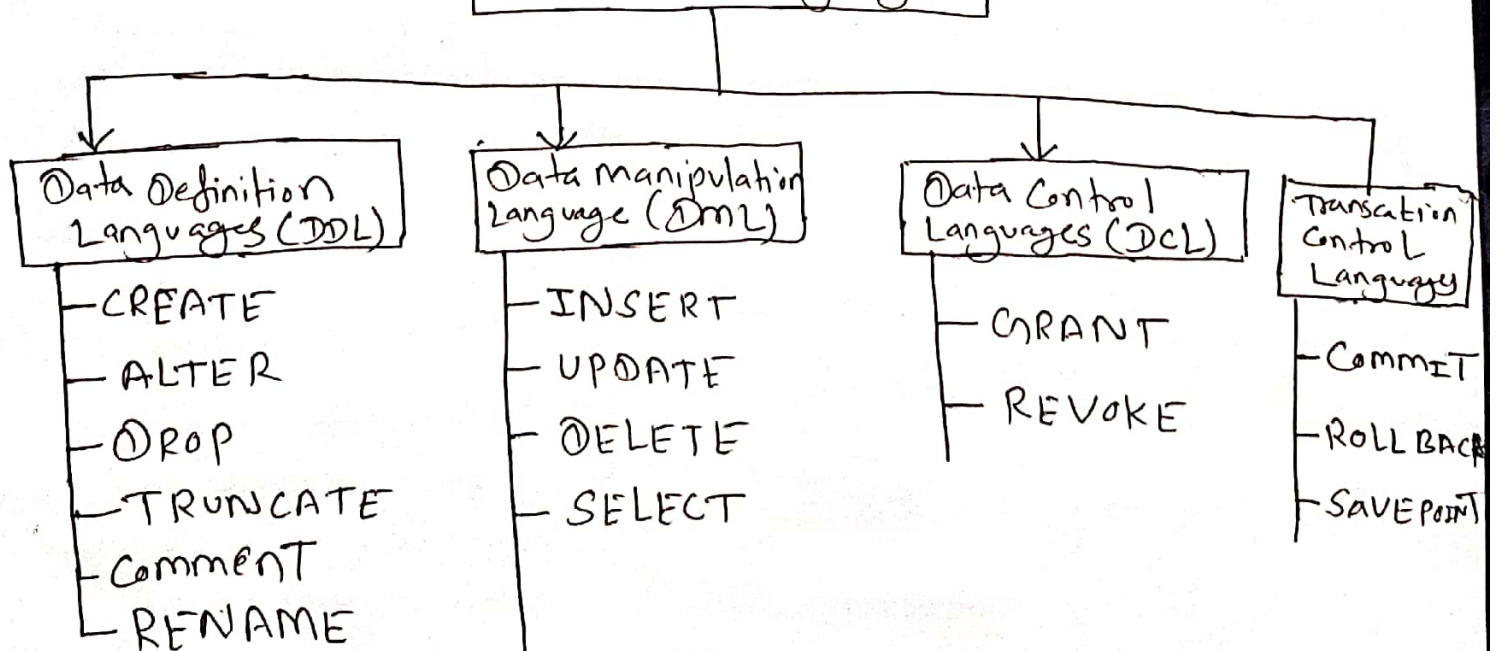
Database Languages are used to perform operations on a database.

Database Language helps users to create, manage, update and retrieve data from a database.

Types of Database Languages in DBMS are:-

- i Data Definition Language (DDL)
- ii Data Manipulation Language (DML)
- iii Data Control Language (DCL)
- iv Transaction Control Language (TCL)

Database Languages



① Data Definition Language :- Language that define the Schema or structure of the database.

- ① CREATE :- TO create tables or databases.
- ② ALTER :- used to modify the structure of an existing table, such as adding, deleting or modifying columns.
- ③ DROP :- used to delete an entire database or table permanently.
- ④ TRUNCATE :- used to delete all records from a table but not the structure.
- ⑤ RENAME :- used to rename an existing table.

② Data manipulation Language :- DML is a subset of SQL that are used to manipulate and manage data in a database. DML focuses on data retrieval (Select), insertion, updation and deletion.

- ① SELECT :- used to retrieve or fetch data from tables.
- ② INSERT :- used to add new records (rows) into a table.
- ③ UPDATE :- used to modify existing records in a table.
- ④ DELETE :- used to remove records from a table.

(iii) Data Control Language :- DCL is used to control access and permissions for the database.

(i) GRANT :- Used to provide specific permissions to a user or a group of users.

(ii) REVOKE :- Used to remove previously granted permissions or privileges. / take back permission.

(iv) Transaction Control Language :- A Language which manages the transactions within the database.

Commit → to save permanently

Rollback → to undo change

Savepoint → to save temporarily

Who is DBA? What are the responsibilities of DBA?

→ Database Administrator (DBA) is a person ^{who is} responsible for controlling, maintaining, coordinating, and operating a database management system.

→ Managing, securing and taking care of the database systems is the main responsibility of the DBA.

→ A person or an individual who is responsible for managing and maintaining databases in an organization. DBA ensures that databases are run smoothly.

Responsibilities of DBA are:-

- ① Database Installation and setup:- The DBA installs and sets up database software on servers.
- ② Database maintenance:- DBA keep the database running efficiently, making sure it is always for use. This includes regular checks, updates, & ensuring performance is optimized.
- ③ Backup and Recovery:- DBAs regularly back up the database to prevent data in case of failures. They also make plan & strategies to restore data if anything goes wrong.
4. Security management:- DBAs protect the database by setting up security measures such as user permissions, passwords, and encryption to prevent from unauthorized access.
5. Improving performance:- DBAs monitor and improve the performance of database, ensuring that it responds quickly and does not.

get slow, even when large amounts of data are used.

6. Data integrity :- DBAs ensure that the data is accurate, consistent and reliable.
7. Query optimization :- DBAs optimize queries, which are requests made to the database, to make sure they are processed quickly and efficiently.
8. Troubleshooting :- If there are any issues with the database DBAs investigate and solve problems to avoid disruptions.
9. upgrades and patches :- DBAs keep the database software up to date with new features, bug fixes, and security patches.
10. User support: They provide support to users and developers who need help with database related tasks.

Explain the different models of DBMS with advantages and disadvantages.

A database model is a way of organizing and structuring data in a database.

A database model defines how data is stored, how relationships between data are handled, and how the data can be accessed or manipulated. Using a database model, you can define how you want the application data.

There are various database models of DBMS that are:-

- i) Hierarchical model
- ii) Network model
- iii) Relational model
- iv) object oriented model
- v) ER Model

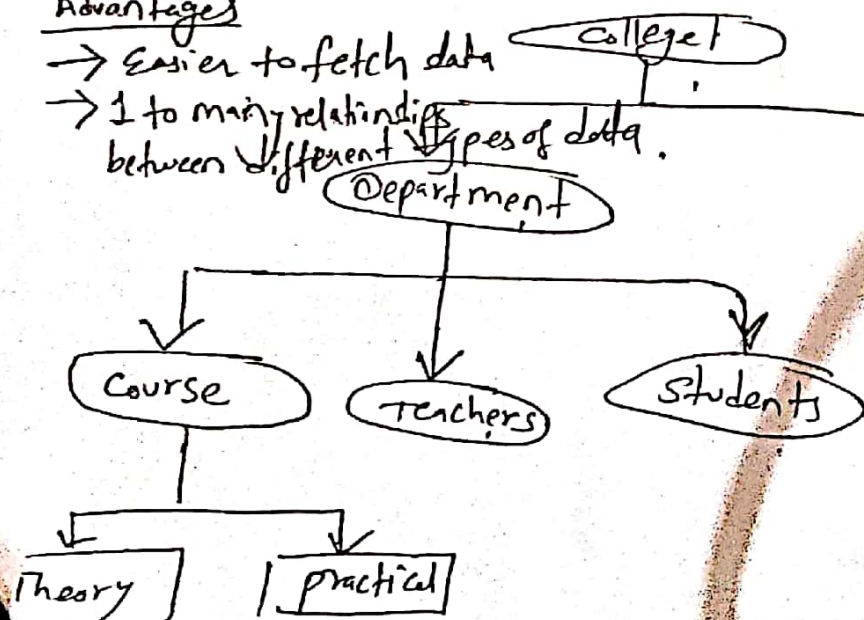
- vi) NoSQL model
- vii) Graph Model

① Hierarchical model :- Data is structured like a tree, with parent-child relationships. (1:N relationship).

→ The hierarchy starts from the root data, and expands like a tree, adding child nodes to the parent nodes.

Advantages

- Easier to fetch data
- 1 to many relationships between different types of data.



Disadvantages

- i) Less flexible
- ii) Doesn't support many-to-many relationships.

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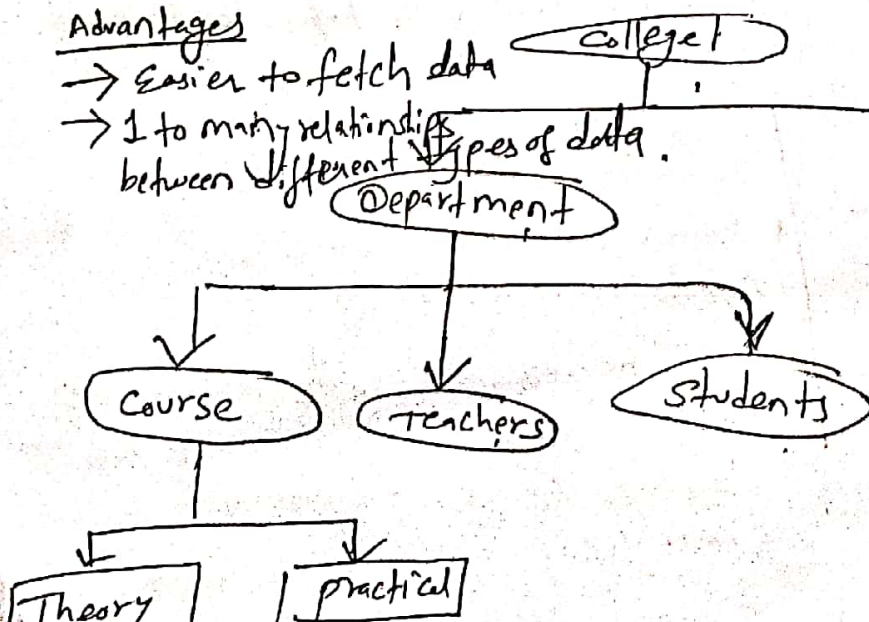
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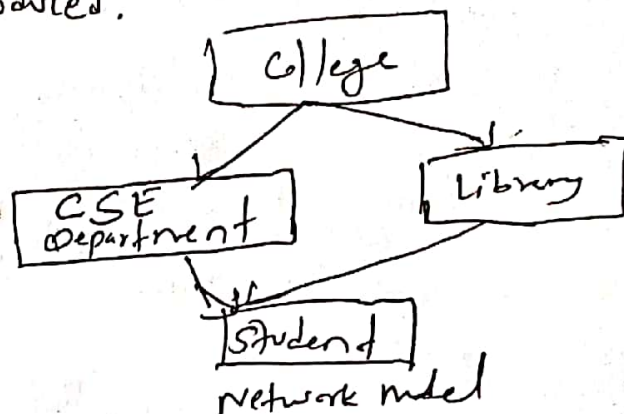
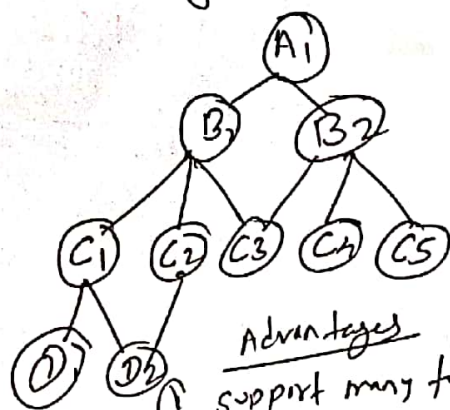
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② Network model:- Network Model is an extension of hierarchical model. Data is organized as nodes and interconnected by edges (many-to-many relationships). Data are organized more like a graph, and allowed to have more than one parent node. This model used widely before Relational model was introduced.



Advantages
 support many to many relationships
 Data retrieval is fast because of pointers

Disadvantages
 Difficult to Design and maintain
 Need deep knowledge of model
 less popular than relational model

③ Relational model:- Data is stored in tables (rows and columns) relationships defined using keys.

ID	Name	Age	Salary	Post
1	Rajsh	20	10,000	Beginner
2	Hari	21	15,000	Intermediate
3	Shyam	22	18,000	Expert

ID, Name, Age, Salary, Post are attribute

[1 | Rajsh | 20 | 10,000 | Beginner] is a tuple or Record.

Advantages
 → Easy to use due to table structure
 → widely supported by DBMS like MySQL, PostgreSQL

Disadvantages
 → Slower for complex queries needs normalization.
 → performance can degrade with a very large dataset.
 → Requires careful normalization to avoid anomalies.

④ Object oriented model :- Data is stored as objects with attributes and methods.

Class Student

Attributes:

Student ID

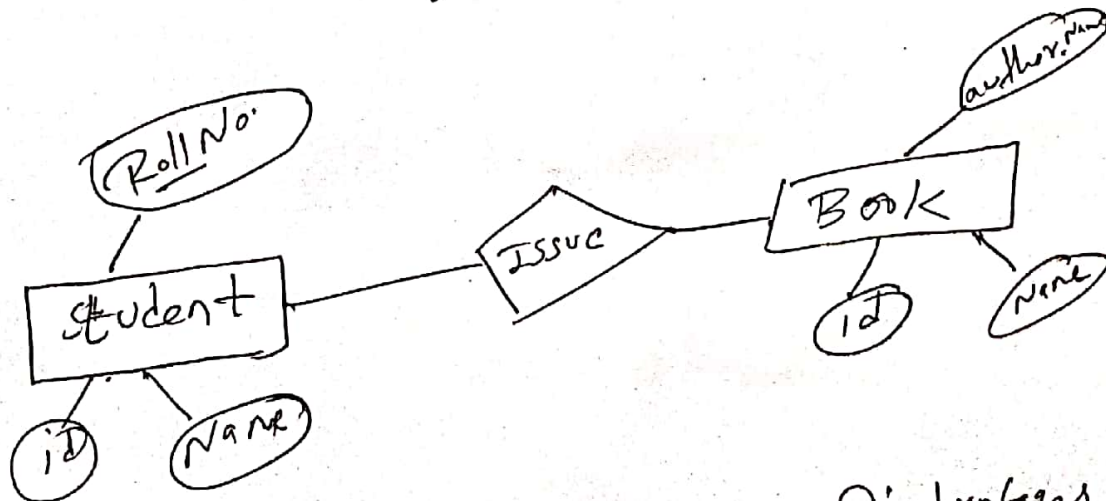
Student Name

Methods:

enroll()

Advantages	Disadvantages
→ suitable for complex datatypes	→ Difficult to learn,
→ supports inheritance and reusability of objects.	→ Not widely adopt
→ protecting data from unauthorized access due to encapsulation	→ Limited query support

⑤ ER (Entity-Relationship) model :- Data is represented as entities (objects) and relationships (connections).



Advantages

- Simple and clear visualization of data relationships.
- Helps in designing relational databases
- Easily adaptable to changes in requirements

Disadvantages

- Can't store data directly must convert to relational model.
- Knowledge is required to design ER-Diagram.