

Diploma Wallah

Database System Concepts and PL/SQL

* Introduction

* Data

- * Data is the collection of raw facts and figures.
- * These are the facts and may consist of numbers, text, etc. symbol etc.
- * These are gathered and entered into a computer system.
- * The computer system is then stores, retrieve, classifies, organises & synthesise the data to produce information according to a pre-determined set of instruction.
- * The data is therefore processed & organised to create information that is relevant and can be used for decision making.

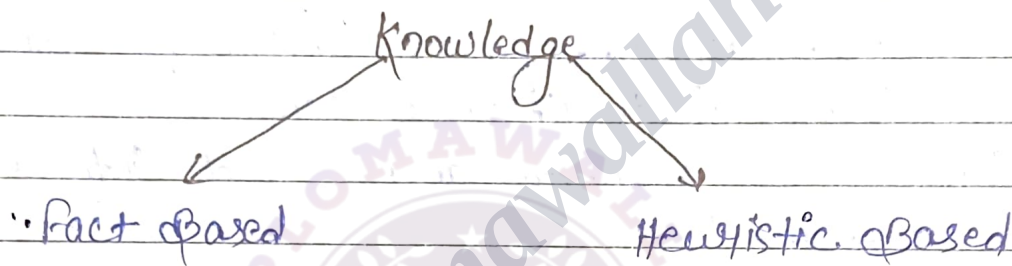
* Information

- * Information is organized or classified data, which has some meaningful values for the receiver.
- * Information is the processed data on which decision & action are based.

Knowledge

* Meaningful data called Knowledge.

Human mind purposefully organise the information and evaluate it to produce Knowledge. Is a data and marks of student is information and the hardwork requisite to get mark is Knowledge.



1) Fact Based:

The Knowledge gain from fundamental & through experiment.

2) Heuristic Based:

It is Knowledge of good practice and good judgement like 'hypothesis'.

Difference between Data and Information

Data

- 1) Data is the raw fact.
 - 2) It is not significant to a business.
 - 3) Data are Atomic level piece of Information.
 - 4) Data does not help in decision making.
- Examples: product name, name of student

Information

- It is the processed form of data.
- It is the significant to a business.
- It is a collection of Data.
- It help in decision making.
- Example: Report Card Sheet.

* Database:-

The related information when placed in an organised form makes a database or an organised collection of related information is known as database.

Example:- Dictionary, Telephone Directory, mobile Contact.

* Importance

- Data organization, Quick access and Retrieval
- * Data Consistency
- * Data Security
- * Multiusers access
- * Backup Recovery
- * Reduced data Redundancy

Operation perform on Database

- 1) Insertion
- 2) updation
- 3) Deletion
- 4) Retrive
- 5) Sorting

Topditional file System:

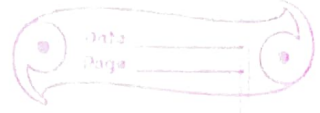
File System:

A file System is the method of storing and organising the Computer files and the data they contain to make it easy to find and access them.

Characteristics of file System:

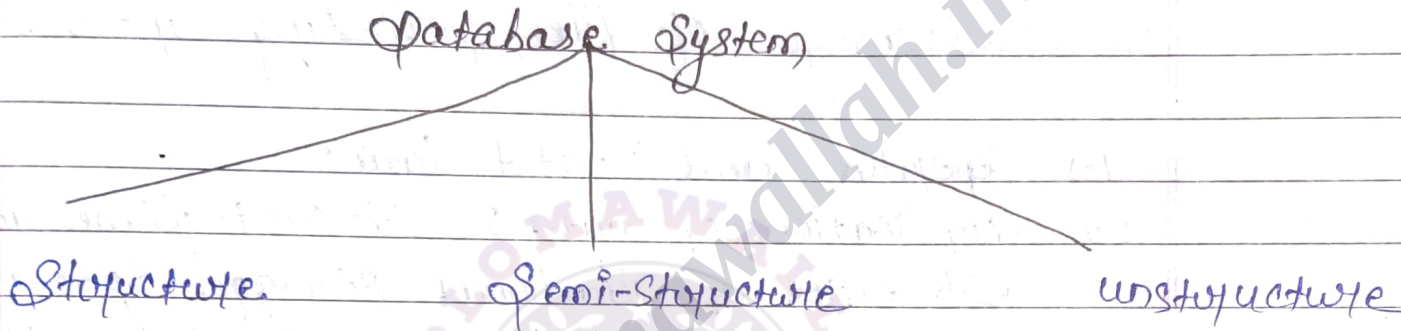
1. It is a group of file for storing the data of an organisation.
2. Each file is independent from one another.
3. Each file is called a flat files.

4. Files are design by using the pruggyam



Written in programming language such as, C++

* Some DBMS software like :- mysql (Xampp, wamp)
Oracle, DB



Structure:-

The data which are organised in the specific format and in the form of table called Structured data.

Semi-Structure:-

The data which may or have some organised data and also not and some are in un-organised format called Semi-Structure.

Unstructured:-

The data which is not in the form of organised form is called unstructured data.

Ex- website (The unformatted data).

* Disadvantages of file processing system:

- 1.) Separated and isolated data.
- 2.) Duplication of data :- It cost time and money.
 - It takes up additional storage space.
 - It can lead to loss of data integrity.

3. Data dependencies :-

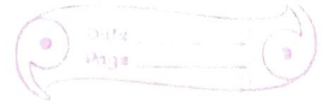
Files and records were describe by specific physical format that were code in the application program by the programs.

4. Difficulty in representing the data from the user point of view.

5. Data security is low.

6. Transactional problems.

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7. Concurrency system:- When multiple users access the same data at a same interval of time then it is called Concurrency system.
Concurrency is low.

* Building Block of Database:-

1. Column $\rightarrow$ Fields
2. Row $\rightarrow$ Tuple / Record
3. Tables $\rightarrow$ Relation.

* DBMS (Data Base Management System):

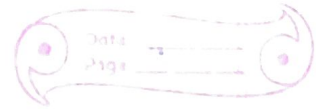
It is the software system that allow the user to define, create and maintain the database and provide control access to the data.

Application of database

1. Library System
2. Banking System
3. ATM

Differentiate b/w File management System and DBMS

DBMS	File management System
* A System that manages files and * A Software system that stores, retrieves, and manages data in a structured way. * Data stored in tables with rows and columns in a structured format, supporting relationships b/w data. * Sender and receiver both has other system. * It gives the data of specific (individual) * High Security * It provide Role based Security (according to their authorization) * Redundancy is low (Repeat) * ^{high} Concurrency (Multiple user can access) * ^{high} Consistency	- A system that manages files and folders on storage devices. - Data stored in plain files, often in hierarchical file system. (text file, csv file) - Sender and receiver has both one system. - It gives the data of entire from one search. - Low Security - It do not provide Role based Security. - Redundancy is high.



* Disadvantage of DBMS:-

Complexity

Size

performance

Higher impact of failure

Cost of DBMS.

* Data model

It can be define as an integrated collection of concept for describing and manipulating the data, relationship between the data and constraint on the data in an organisation.
(condition to implement on data)

Data model are :-

1. Hierarchical model:-

* It is the first DBMS model. This model organize the data in the hierarchical tree structure.

* It is based on tree structure. It consist of collection of records that are connected to each other by links.

* The tree structure use in a hierarchical model is known as rooted tree.

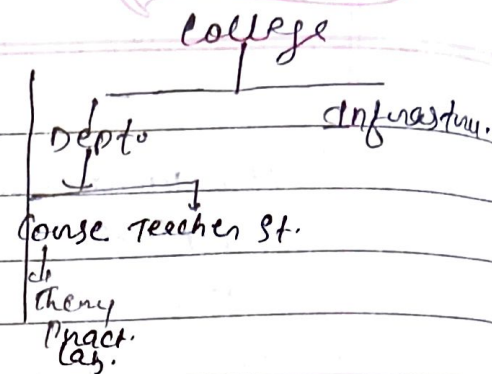
* The root node of that tree is an empty node.

* In this model we have to visit all node.

Date _____
Page _____

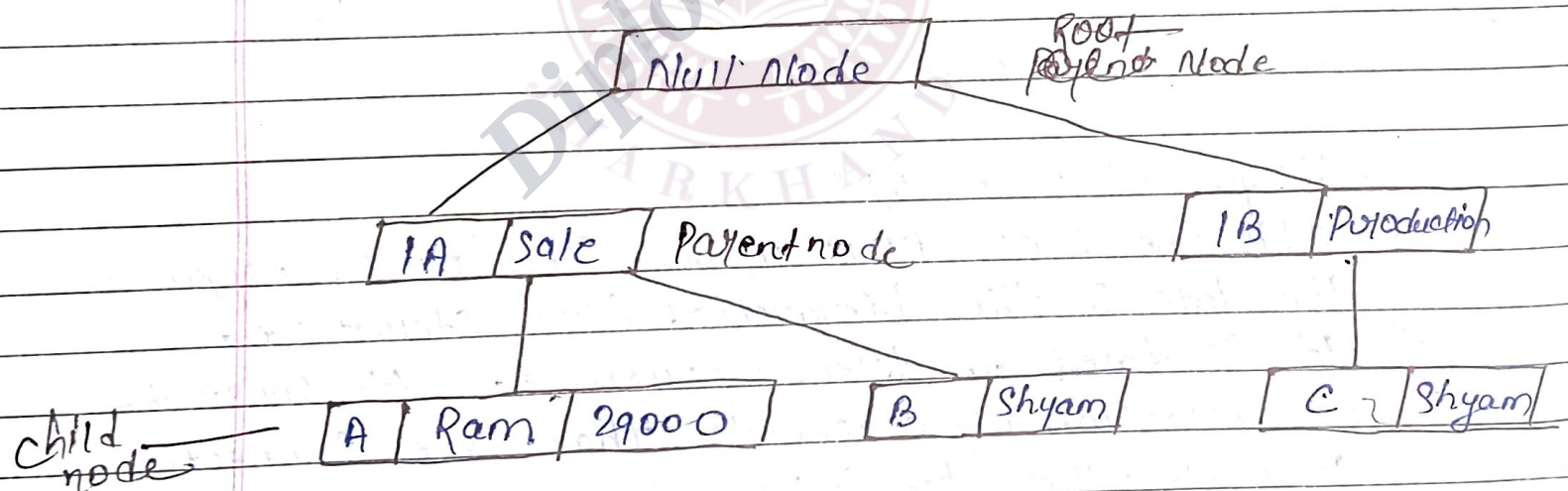
Advantages

- 1) It is easy to understand
- 2) more efficient than ER model.



Disadvantages

- 1) Data inconsistency occur when the parent node is delete. that result in the deletion of the child node.
- 2) wastage of Storage Space.
- 3) complex to design
- 4) Absence of Structural independency.



[EMP.ID | EMP.Name | Salary |

depto	Dept.
ID	Name

To overcome from Hierarchical model we use Network model.
* Directly connected to child node or node.

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Page: _____

2) Network model:-

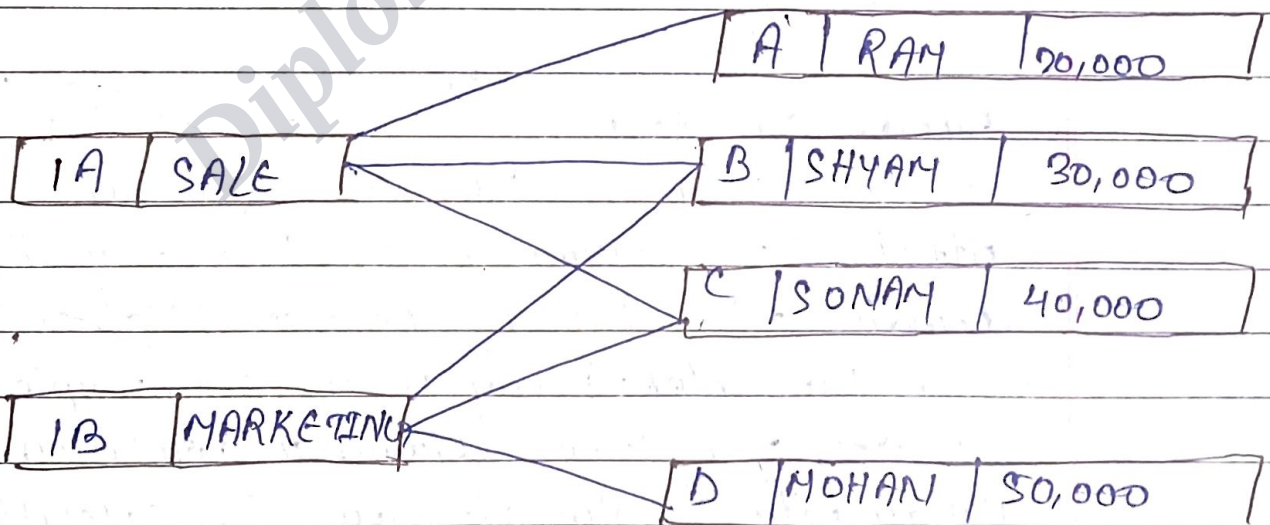
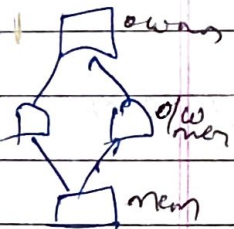
It is based on Graph Structure. It consists of collection of records, which are connected to each other by links.

Advantages

- * It is easy to design than the Hierarchical model.
- * Data access is easy in the Network model.

Disadvantage

- i) It is complex to design than a relational model.
- ii) Efficiency are less than the relational model.
- iii) Absence of Structure independency.



For one to many →
one to one ↔
many to many

- * Relational model is way to represent data in tabular form using rows and columns.
- * It is most widely used data model in database system.
- Advantage
- Simple and easy to understand, Powerful for Querying (SQL), maintaining data integrity and avoids duplication.

3. Relational model:-

Relational model stores data in form of tables.

Employee

Emp. id	Emp. Name	Salary	Department	
1	A	20,000	Dep id	Name
2	B	30,000	A	Sales
3	C	40,000	B	Marketing
4	D	50,000		

Tuple Variable.

Domain

- Complexity with large data

In terms of DBMS

Table → Relation (Data stored in tables, where each represent entity).

Tuple → rows (each row of data)

Attributes → Column (each column in the tuple)

Domain → Set of permitted values

Tuples Variables → Any value of a Tuple

Degree → No. of column in a relation

Cardinality → No. of rows in a relation

* primary Key :- (tuples)

A column that uniquely identifies each row.

* Foreign Key: A column links two tables together by referring to primary key of another table.

Adv Real world modeling, Reusability through inheritance, encapsulation.

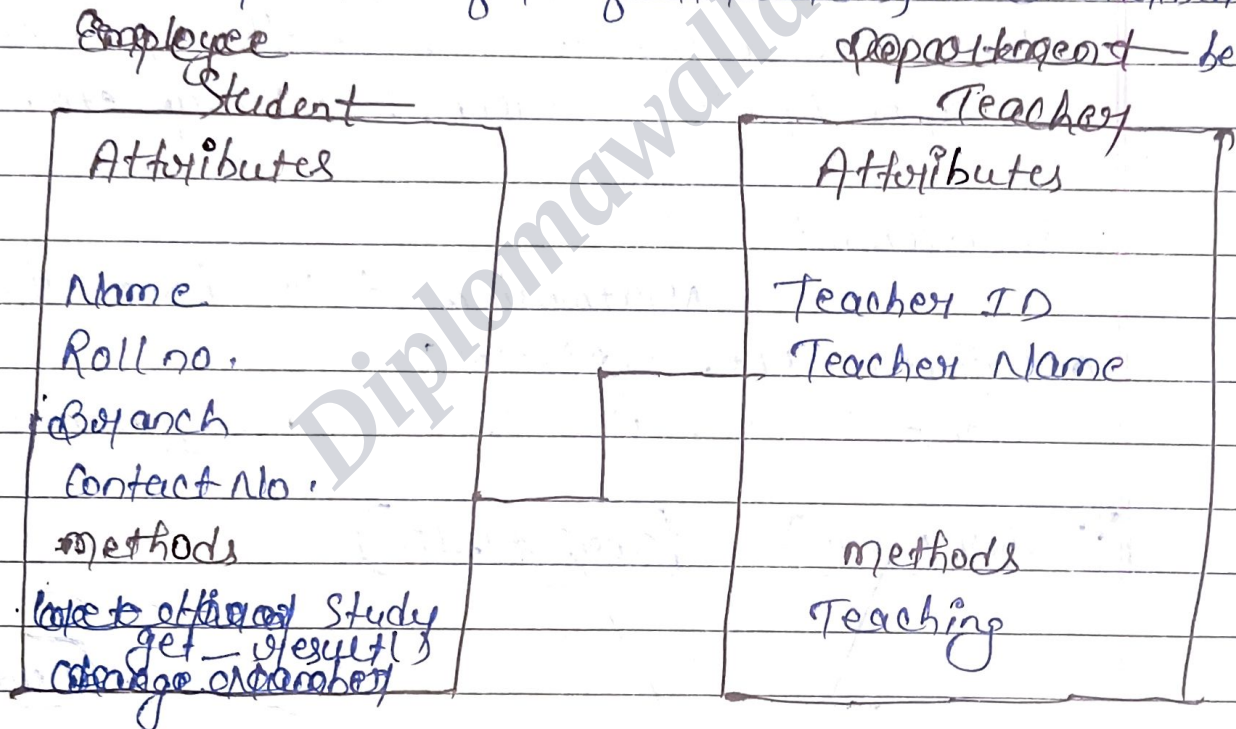
Object is collection of data member and behaviour.
It's complex design, slow for simple application, less mature technology, difficult to learn.

4. Object Oriented model

When both the data and relationship are present in a single structure known as an object.

We can store audio, video, images etc. in a database which was not possible in relational model.

* Data stored in the form of attribute by its attributes & behaviour.



5. Entity Relationship model

Entity Relationship model or simply ER model is a high level data model diagram.

In this model we represent the real-world problem in the pictorial form to make it easy.

Adv Clear visual representation
help in database design
Easy communication
Foundation for Relational
model.

Dis Not a database model
Cannot Represent complex
logic
limited use after design.

for the Stakeholders to understand.

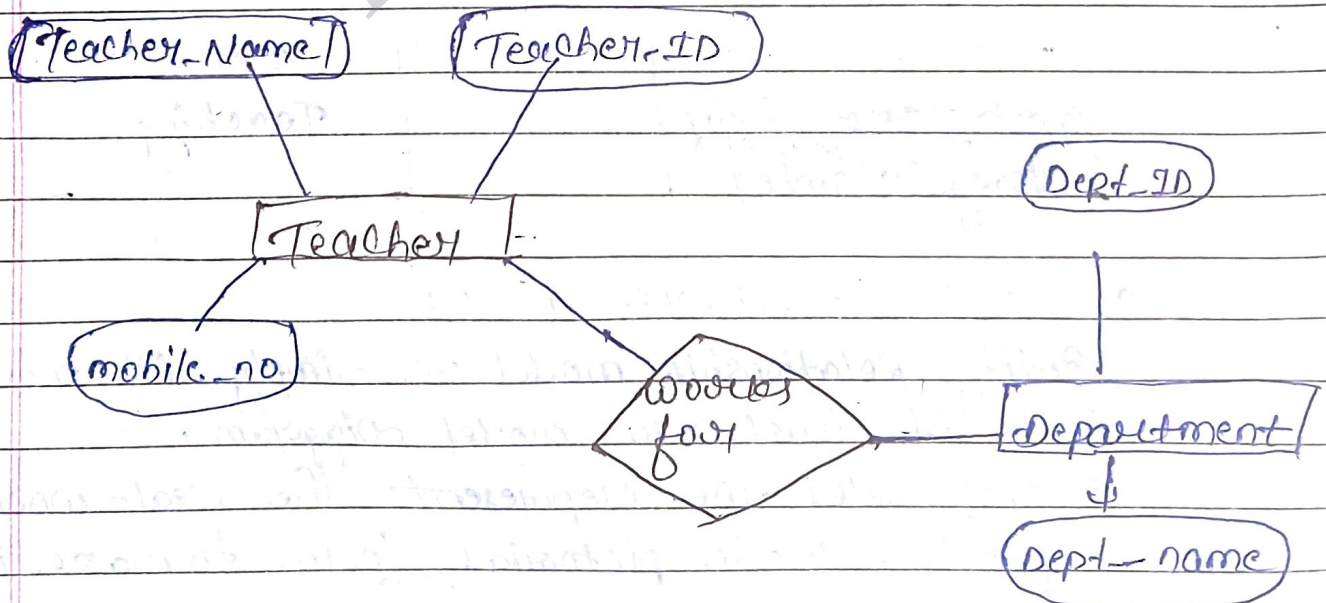
- **Entities:** — Entity is a real world things.
It can be person, place or even a concept.
Ex - Teacher, Students, Course, Building etc.

- **Attributes:** — An entity contains a real-world property called Attribute.
This is the characteristics of that attributes.
Ex - The entity teachers has the ~~property~~ properties like teacher ID, Salary etc.

- **Relationship** →

Relationship tells how two attributes are related.

Ex - Teacher works for a Department.



Symbol name

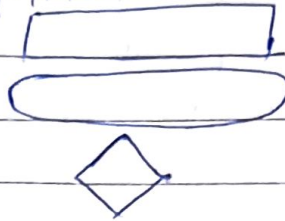
Entities

Attributes

Relationship

Link

Symbol:



* Architecture of DBMS:

There is 3 level

1.) External Level

2.) Conceptual Level

3.) Internal Level

Objective of three level Architecture or Sparc 3 level Architecture:

The objective is to separate each user view of the data from the way the database is physically represented.

* The internal structure of the database of the should be unaffected while changes to the physical aspects of storage.

* The DBA should be able to change the Conceptual Structure of the Database without affecting all other.

1.) External level/view level:-

This level describes that part of the database that is relevant to each user. This level insulates the users from the details of conceptual and the internal level.

The three tier of Architecture are:-

Adv
✓ Simple setup
* low cost

1.) One - Tier Architecture

* The database and the user interfaces are on the same system.

Dis
Limited scalability

* A single layer where the database resides on the user's local machine.

Maintenance
Can be more difficult

* used for standalone application testing, or small-scale system.

∴ API is used.

Components:-

→ Client (user interface):- layer interacts with system.

→ DBMS: Database and management run on the same machine.

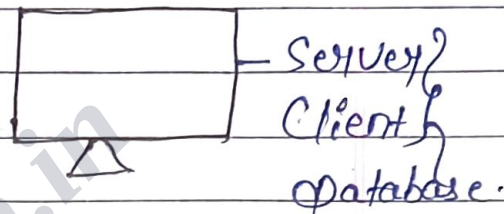
How works

→ The user interacts directly with the database through user interface.

→ The application logic and database are on the same system, so there is no need of network communication.

* Not suitable for multi-user environment.

Example:- A Microsoft Access database stored and accessed directly on a personal computer.



2.) Two-tier Architecture

The system is divided into two layers:

- Client (user interface & or application layer)

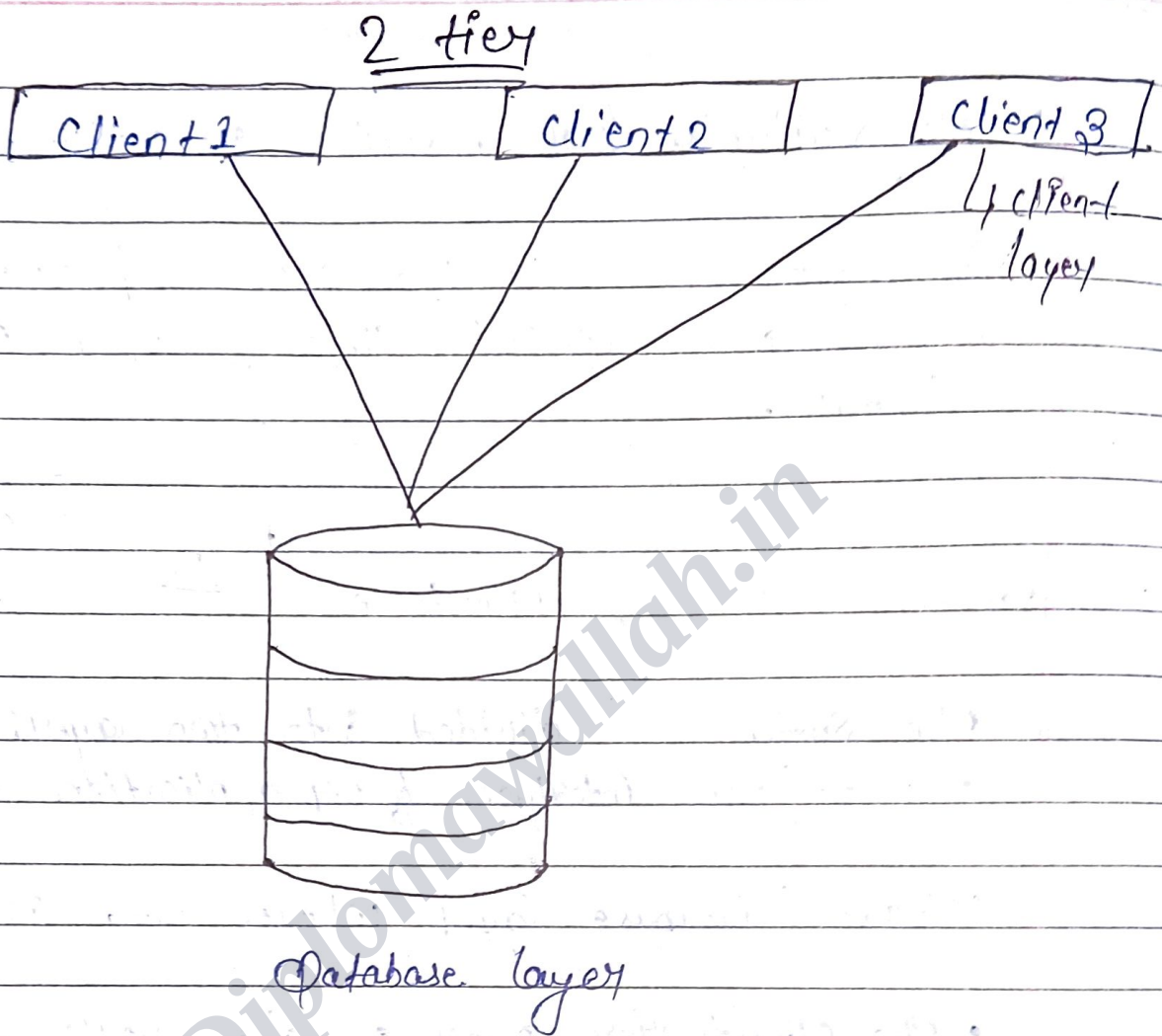
- Server (database layer where data is stored)

- The client tier processes the user's request and send queries, retrieves data, and sends results back to the client.

- Can use in small to medium-sized application where the client interacts directly with the database.

- Limited scalability as more client are added is main limitation.

Example:- A Java program accessing a MySQL database.



3. Three - tier Architecture:-

The system is divided into three architecture's

- presentation Tier (user Interface) / client layer

- Application Tier (logic layer or middleware) / Business layer

- Data Tier (database)

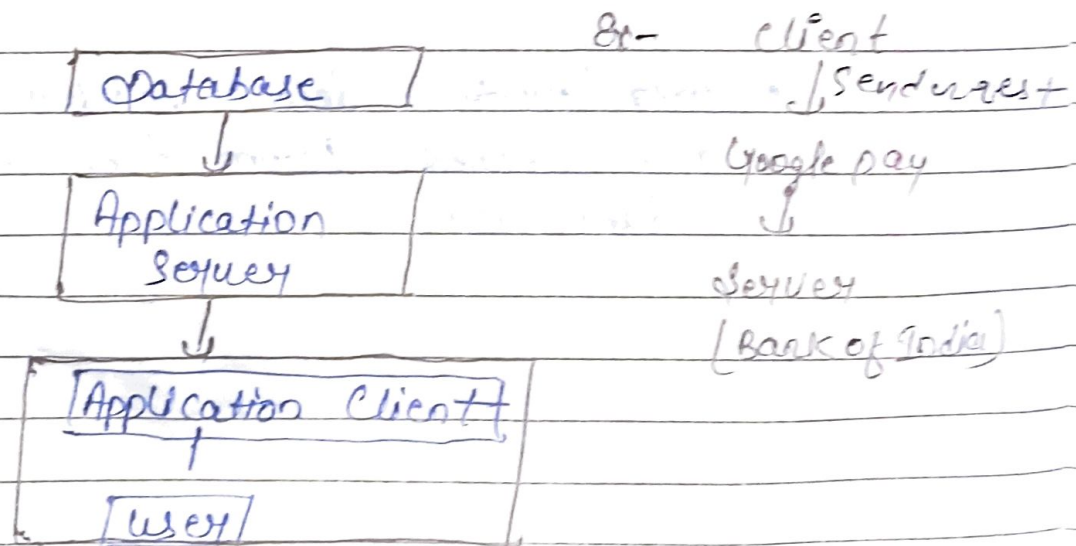
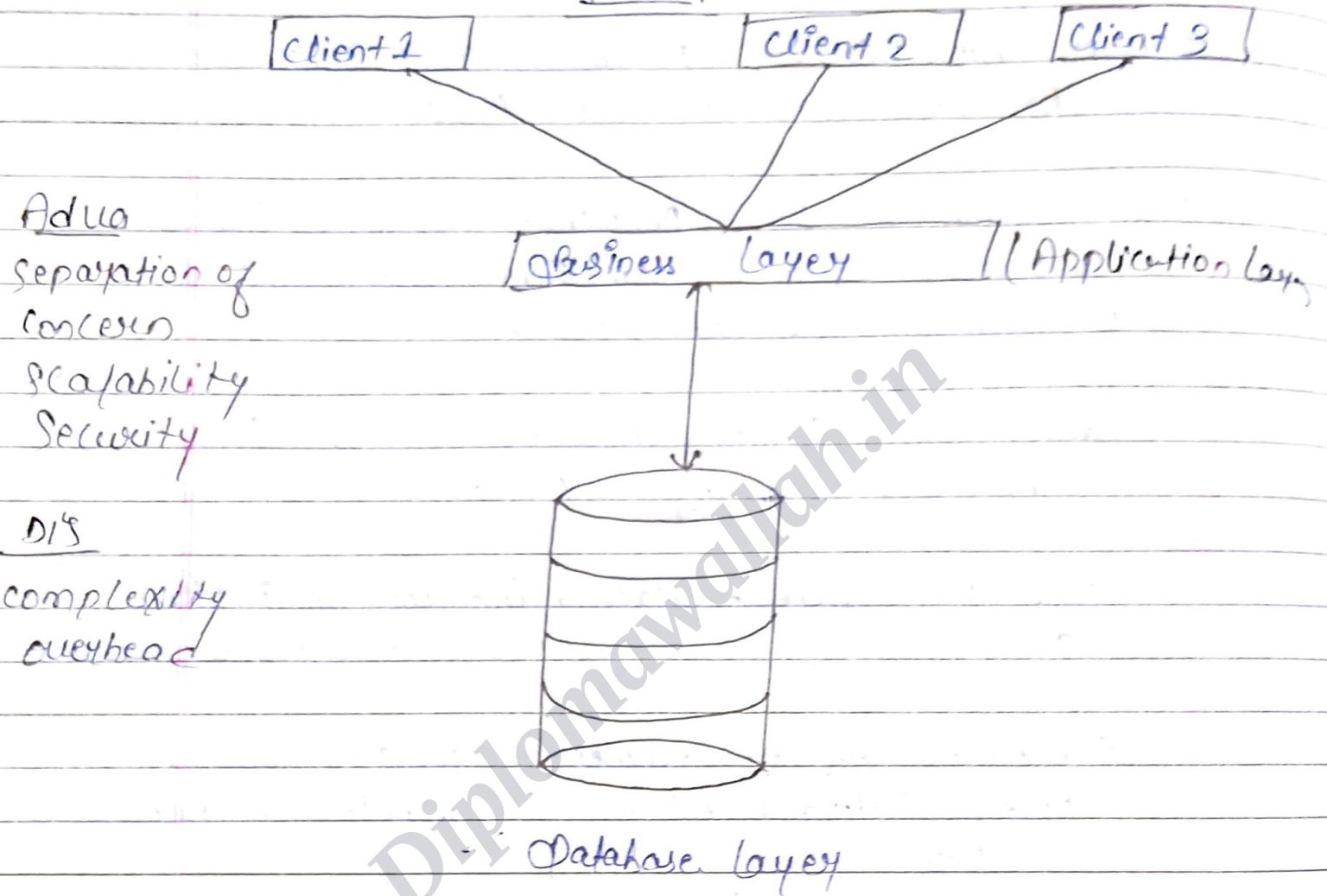
- * Application layer:- This layer processes the business logic, handles request from client and communicate with database.
- * Data layer:- The layer where the actual dbms and data are resides (store), where it display the web.

- presentation Tier:- provides the interfaces for the user (web browser, GUIs, etc)
- Application Tier:- processes business logic and acts as an intermediary b/w the presentation and data tiers.
- Data Tier:- Stores and retrieves data, ensuring security and efficiency.
- use in large-scale, distributed system such as web application and enterprise software.

Example:- An e-commerce website where:

- users interact with the front-end (presentation tier)
- Business rules (like calculating discounts)
- data (product details, orders) is stored and fetched from the database in the data tier.

Client send request to application —
 ↓
 Application layer processes logic, interact data layer,
 modify or fetch.
 After processing data is sent back to app layer.
3 tier



GPA → Relation (Table)

Tuple (Row)			Rollno.	Name	Branch	Attributes
01	A	CSE	01	A	CSE	(Rollno.
02	B	ME	02	B	ME	Name
-	-	-	03	C	Civil	Branch)
-	-	-	04	D	meta	
-	-	-	05	E	elec.	

↓
Field

* Disadvantages of DBMS

1. Complexity:- The provision of the functionality that is expected of a good DBMS makes the DBMS extremely complex piece of software.

2. Size:- The complexity and breadth of functionality makes the DBMS an extremely large piece of software, occupying megabytes of disk.

3. Performance:- A file based system is written for a specific application such as invoicing. A result performance is very good.

4. Higher Impact of a failure:-

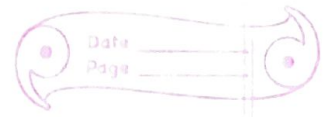
The centralization of resources increase the vulnerability of the system.

5. Cost of DBMS:-

The cost of DBMS varies significantly depending on the environment and functionality provided.

File management (eg. C++, or python) files.	Database management eg - Oracle or MySQL
1.) Small system	1.) Large system
2.) Relatively Cheap	2.) Relatively expensive
3.) Few files	3.) many files
4.) Files are files	4.) Files not necessarily files.
5.) Simple Structure	5.) Complex Structure
6.) Little preliminary design.	6.) vast preliminary design.
7.) Integrity left to application programmer.	7.) Rigorous in built integrity checking.
8.) No Security	8.) Rigorous Security.
9.) Simple primitive backup/recovery	9.) complex & backup/recovery
10.) often single user	10.) multiple user

→ Logical Schema - user show (how to represent data to user). Key
 → how to data store and where be stored. is managed by physical layer.



Data Independence (data in one level may change but in another level may not change na koi change)

directly connected to user.

External level (view level)

how the data will be presented.

Logical level

logical data independency

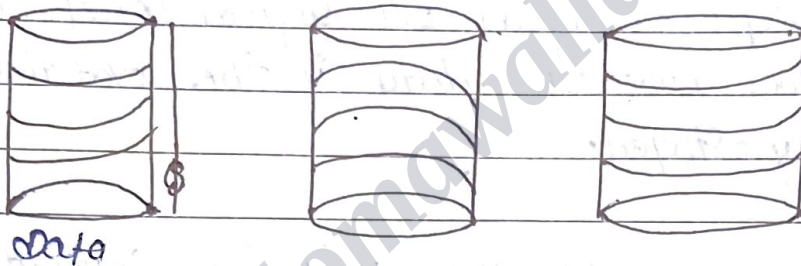
(Independent with external level)

Physical data independency

Stores data in the form of files or folders.

Physical level

(Full independent)



data

Storage Database

→ If we change the any level of data the upper level of data will not affected.

External level:-

This is the highest level in the three level architecture and closest to the user.

It is also known as the view level. The external level only shows the relevant database content to the users in the form of views and hide the rest of the data.

logical level

The logical level or conceptual level is at a higher level than the physical level. It is also known as the logical-level conceptual level.

- * It describes how the database appears to the users conceptually and the relationship between various data tables.
- * The conceptual level or logical level does not care for how the data in the database is actually stored.
- * If we do any change in the conceptual view of the data, then the user view of the data would not be affected.
- * - logical data independence occurred at the user interface level.

physical level

This is the lowest level in the three level architecture. It is also known as the internal level.

The physical level describe how data is actually

Stored in the database.

In the lowest level, this data is stored in the external hard drives in the form of bits and at a little high level, it can be said that the data is stored in files and folders.

- physical data independence can be defined as the capacity to change the internal schema without having to change the conceptual schema.
- If we do any changes in the storage size of the database system server, then the conceptual structure of the database will not be affected.

* SCHEMA :-

Logical representation of a database.
is called Schema.

* It shows how the data is organized and the relationship between the tables.

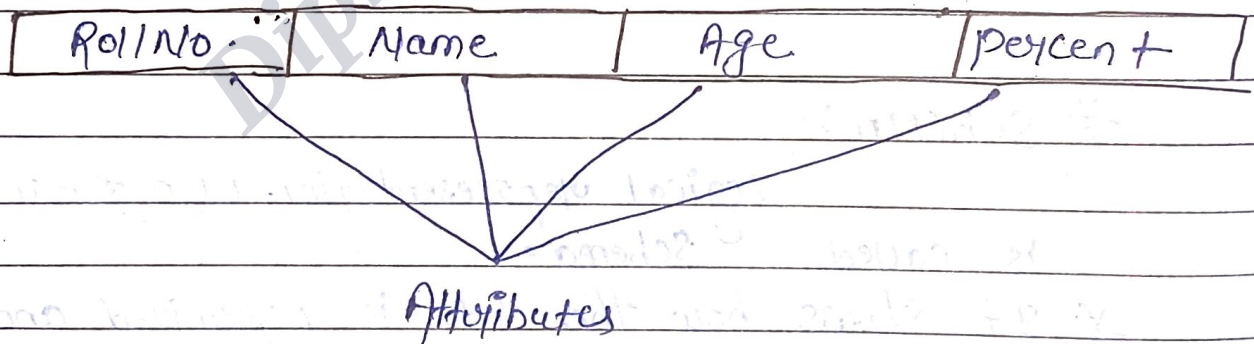
* Database Schema contains table, field, views and relation b/w different keys like primary key, foreign key.

* Data are stored in the form of files which is unstructured in nature. which makes accessing the data difficult.

* Database Schema provides the organisation of data and the relationship b/w the stored data.

* Database Schema defines a set of guidelines that control the database along with that it provides information about the way of accessing and modifying the data.

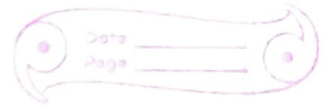
Representation of Schema



The data which we view is known as logical Schema.

* Schema is also known as Intension.

DBA choose from the candidate as primary key.



Database Administrator (DBA):

- * A Database Administrator (DBA) is ^{a group person} individual or person responsible for controlling, maintenance, coordinating, and operation of database management system.
- * Managing, securing and taking care of database system is prime responsibility.
- * They are responsible and in charge of authorizing access to the database, coordinating, capacity, planning, installation and monitoring uses, and acquiring and gathering software and hardware resources as and when needed.
- * Their role also varies from configuration, database administration is a major and key function in any firm or organization that is relying on one or more database.
- * They are overall commanders of the database system.
- * provides Role based Security.

Importance of Database Administrator:

- * Database Administrator manages and controls three levels of database like internal level, conceptual level, and external level of Database management System architecture and in discussion with Comprehensive user community.
- * Database Administrator ensure held responsible to maintain integrity and security of database restricting from unauthorized users.
- * It grants permission to users of database and contains profile of each and every user in database.
- * Database Administrator also held accountable that database is protected and secured and that any chance of data loss keep at minimum.

Key Responsibility

1. Database Installation and Configuration
 - * Install and configure dbms software (like MySQL, Oracle, SQL Server).
 - * Setup Database servers and create initial database structure.
2. Database design
 - Help in designing the database schema (tables)
 - Define datatype, key, constraint, indexes.
3. Backup recovery
 - Setup regular backup schedules.
 - Restore databases in case of data loss or corruption.
4. performance monitoring and tuning.
 - monitor database performance (speed, efficiency)
5. user management
 - Create and manage user account
 - Control user permission to ensure data security
6. Security management
 - protect data from unauthorized access.
 - Implement encryption, firewalls and access control.
7. Troubleshooting and Maintenance.
 - Identify and resolve database-related issues.

- Skills :- Strong Knowledge of SQL and DBMS tools.
- Familiar with operating system.
 - understanding networking data security
 - problem solving and analytical thinking.

Types

1. System DBA:- Focus on installation ; configuration and maintainance.
2. Database Architect:- Design structure and logic of database.
3. Application of DBA:- 'works' closely with developers to support application using the database.
4. performance DBA:- Specializes in optimizing performance.

Why 'Important?

* Without DBA, the database might become slow, vulnerable to attack or fail completely.

* They ensure data integrity, availability and security.