1. **What is a database? Explain with an example on why should we need a database.**

:- A database is a systematic collection of data. They support electronic storage and manipulation of data. Databases make data management easy. Let us discuss a database example: An online telephone directory uses a database to store data of people, phone numbers, and other contact details.

Databases support good data access because: Large volumes of data can be stored in one place. Multiple users can read and modify the data at the same time. Databases are searchable and sortable, so the data you need can be found quick and easily.

1. **Write a short note on File base storage system. Explain the major challenges of File-based storage system.**

:- The systems that are used to organize and maintain data files are known as file based data systems. These file systems are used to handle a single or multiple files and are not very efficient.

Functionalities

The functionalities of a File-based Data Management System are as follows −

* A file based system helps in basic data management for any user.
* The data stored in the file based system should remain consistent. Any transactions done in the file based system should not alter the consistency property.
* The file based system should not allow any illegal or potentially hazardous operations to occur on the data.

Advantages of File Based System

* The file Based system is not complicated and is simpler to use.
* Because of the above point, this system is quite inexpensive.
* Because the file based system is simple and cheap, it is normally suitable for home users and owners of small businesses.
* Disadvantages of File Based System
* The File based system is limited to a smaller size and cannot store large amounts of data.
* This system is relatively uncomplicated but this means it cannot support complicated queries, data recovery etc.
* There may be redundant data in the file based system as it does not have a complex mechanism to get rid of it.

**3. What is DBMS? What was the need for DBMS?**

:- A database management system (DBMS) is a software tool that enables users to manage a database easily. It allows users to access and interact with the underlying data in the database. These actions can range from simply querying data to defining database schemas that fundamentally affect the database structure

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* 1. **Explain 5 challenges of file-based storage system which was tackled by DBMS.**

:- a) Data redundancy and inconsistency

File processing system leads to the usage of many copies of same data. This is data redundancy. If we need to change any of the data, then we need to change the data at all copies. If not, this will lead to inconsistency.

For example, let us assume a file for storing addresses of students. If we make three copies of the address file and store them in three different computers, we say that the data is redundant. If suppose one want to change the address of any students, then the change should be made at all the three computers failing which leads to inconsistent data.

b) Difficulty in accessing data

In a file processing system, to access data differently we need to have different programs.

For example, if you want to access student names from a file, we need a program that does the job. If you want to view only address of all students from a specific city, then we need different program that does the required job. This list goes endless. Hence, it is difficult to access data.

c) Data isolation

Files are stored in different locations, different formats. Thus they are isolated.

For example, one location the student data may be stored in .txt format. In other location, the same file may be stored in **.**doc format.

d) Integrity problems

Integrity problem arises when the database fails to satisfy certain integrity conditions.

For example, the phone number cannot be longer than 10 digits, bank balance should not go below 1000 etc. The actual problem arises when we would like to include new such conditions with the existing database. It is hard to make those changes.

e) Atomicity problems

The database must be in a consistent state in spite of failures.

For example, let us suppose that you have a savings account with the balance 5000 and a loan account with an outstanding of 3000. This is the old consistent state. Now you would like to transfer 500 to your loan account. If this transaction is successful, then your savings balance should be 4500 and loan outstanding should be 2500. This is the new consistent state. Suppose a failure occurs during this transaction, the database must be in any one of the 2 consistent states mentioned above.

It is hard to maintain atomicity in file processing system due to data redundancy, data isolation etc.

* 1. **List out the different types of classification in DBMS and explain them in depth.**

:- Several criteria are normally used to classify DBMSs. The first is the data model on which the DBMS is based. The main data model used in many current commercial DBMSs is the relational data model. The object data model has been implemented in some commercial systems but has not had widespread use. Many legacy applications still run on database systems based on the hierarchical and network data models. Examples of hierarchical DBMSs include IMS (IBM) and some other sys-tems like System 2K (SAS Inc.) and TDMS. IMS is still used at governmental and industrial installations, including hospitals and banks, although many of its users have converted to relational systems. The network data model was used by many vendors and the resulting products like IDMS (Cullinet—now Computer Associates), DMS 1100 (Univac—now Unisys), IMAGE (Hewlett-Packard), VAX-DBMS (Digital—then Compaq and now HP), and SUPRA (Cincom) still have a fol-lowing and their user groups have their own active organizations. If we add IBM’s popular VSAM file system to these, we can easily say that a reasonable percentage of worldwide-computerized data is still in these so-called legacy database systems.

* 1. **What is the significance of Data modelling and explain the types of data modelling.**

:- A comprehensive and optimized data model helps create a simplified, logical database that eliminates redundancy, reduces storage requirements, and enables efficient retrieval. It also equips all systems with a ‘single source of truth’ – which is essential for effective operations and provable compliance with regulations and regulatory requirements. Data modeling is a key step in two vital functions of a digital enterprise.

## types of data modelling:-

## Relational:- Although “older” in approach, the most common database model still in use today is relational, which stores the data in fixed-format records and arranges data in tables with rows and columns. The most basic type of data model has two elements: measures and dimensions. Measures are numeric values, such as quantities and revenue, used in mathematical calculations like sum or average. Dimensions can be text or numeric. They are not used in calculations and include descriptions or locations.

## Dimensional:- Less rigid and structured, the dimensional approach favors a contextual data structure that is more related to the business use or context. This database structure is optimized for online queries and [data warehousing](https://www.sap.com/products/technology-platform/datasphere/what-is-a-data-warehouse.html) tools.

* 1. Entity-Rich (E-R):-  An E-R model represents a business data structure in graphical form containing boxes of various shapes to represent activities, functions, or “entities” and lines to represent associations, dependencies, or “relationships.” The E-R model is then used to create a relational database with each row representing an entity and the fields in that row contain attributes. As in all relational databases, “key” data elements are used to link tables together.
  2. **Explain 3 schema architecture along with its advantages.**

:- The three-schema architecture divides the database into three-level used to create a separation between the physical database and the user application. In this architecture contains three layers of database management system, which are as follows −

* External level
* Conceptual level
* Internal level

## External/ View level

This is the highest level of database abstraction. It includes a number of external schemas or user views. This level provides different views of the same database for a specific user or a group of users. An external view provides a powerful and flexible security mechanism by hiding the parts of the database from a particular user.

## Conceptual or Logical level

This level describes the structure of the whole database. It acts as a middle layer between the physical storage and user view. It explains what data to be stored in the database, what the data types are, and what relationship exists among those data. There is only one conceptual schema per database.

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## Internal or Physical level

This is the lowest level of database abstraction. It describes how the data is stored in the database and provides the methods to access data from the database. It allows viewing the physical representation of the database on the computer system.

The interface between the conceptual and internal schema identifies how an element in the conceptual schema is stored and how it may be accessed. It is one which is closest to physical storage. The internal schema not only defines different stored record types, but also specifies what indices exist, how stored fields are represented.