

Define the following terms.

Data

- Data means known facts that can be recorded and stored.
- For example age, salary, result etc...

Database

- A Database is a collection of inter-related Data.
- For example consider a collection of student roll no, name, address, contact number for some student's information. Here all the data roll no, name, address, contact number are inter- related. They all belong to some particular student.
- Any random collection of data is not considered as a database. For example collections of some vehicle number, balance of account, percentage of student do not form a database.

Management

- It is a way in which we maintain the data in the database.
- For example searching of product in amazon, viewing result in UNIVERSITY website, etc.

System

- Programs or tools used to manage database
- For example Microsoft Access, SQL Server Management Studio, Oracle, etc.

DBMS (Database Management System)

- A database management system is a collection of inter-related data and a set of programs to manipulate those data.
- Data manipulation involves various operations such as store data, modify data, remove data and retrieve data.
- DBMS = Database + A set of programs

Metadata

• Metadata is data about data. Data such as table name, column name, data type, authorized user, user access privileges for any table is called metadata for that table.

Data dictionary

- Data dictionary is an information repository which contains metadata.
- Data dictionary contains description of schema, i.e. overall logical structure of the database.
 This can involves information such as table names, owners, column names, data types, size and constraints.



- A data dictionary contains the following components:
 - ✓ Entities: An entity is a thing or object or person in the real world that is distinguishable from all other object. E.g. book, student, employee, college etc...
 - ✓ **Attribute:** Attribute is a property or characteristic of an entity. E.g. Entity is student and attributes of students are enrollmentno, name, address, contact no, etc.
 - ✓ **Relationship:** Relationship is an association (connection) between two or more entities. E.g. book is issued by student where book and student are entities and issue is relation.
 - ✓ Key: A data item or a field which is used to identify a record in a database is referred as key. A primary key is used to uniquely identify a record. For example enrollmentno.

Data warehouse

• Data warehouse is an information repository which stored data. It is design to facilitate reporting and analysis.

Data Items (Field)

- A field is a character or group of characters (alphabetic or numeric) that have a specific meaning.
- It is also called a data item.
- For Example customer id, name, society, and city are all fields for customer Data.

Record

- A record is a collection of logically related fields.
- Here, each field in a record contains a fixed size and fixed data type.
- For examples, collection of fields id, name, society & city forms a record for customer.
- A record contains values for each field.

Files

- A file is collection of related records.
- These records are generally arranged in a specific sequence.



Differentiate the Data and Information.

Data	Information
Data means known facts, that can be	Information means processed or organized
recorded and have implicit meaning	data.
Examples:	Examples:
Student no: 101	Percentage: 81.28%
Student name: Rahul	(Derived from marks of all subject)
City name: Rajkot	• Run rate in cricket match: 6.0
Account No: A01	run/over
Balance: 8000	(Derived from total runs and over)
Data are row materials used to derive	Information is a product derived from Data.
information.	
Data is comparatively less useful.	Information is comparatively more useful.

Applications of DBMS

- DBMS is a computerized record-keeping system.
- DBMS is required where ever data need to be stored.
 - ⇒ E-Commerce (Flikart, Amazon, Alibaba, Snapdeal, eBay, etc...)
 - → Online Television Streaming (Hotstar, Amazon Prime, Netflix, etc...)
 - Social Media (WhatsApp, Facebook, Twitter, Instagram, etc...)
 - ⇒ Banking & Insurance
 - → Airline & Railway
 - Universities and Colleges/Schools
 - → Library Management System
 - → Human Resource Department
 - → Hospitals and Medical Stores
 - → Government Organizations

Explain advantages of DBMS over file management system. OR Explain purpose of database system.

Reduce Data Redundancy (Duplication)

- Due to centralized database, it is possible to avoid unnecessary duplication of information.
- For example all the information about bank customer can be kept centralized. Both accounts saving as well as current can be sharing this information. This prevents unnecessary duplication of customer information that has both types of accounts.



- This leads to reduced data redundancy.
- It prevents memory wastage.
- It also reduced extra processing time to get required data.

Remove Data Inconsistency

- Data inconsistency occurs due to data redundancy.
- For example, consider that customer information is maintained separately for saving accounts and current accounts. Now, it is possible that this changed address is updated in only one file, leaving address in other file as it is.
- As a result of this, same customer will have two different addresses in two different files, making data inconsistent.
- With reduced data redundancy such type of data inconsistency can be eliminated.
- This results in remove data inconsistency.

Efficient Data Access

- DBMS utilizes a variety of techniques to retrieve data.
- Required data can be retrieved by providing appropriate query to the DBMS.
- For example information about all customers or from some particular city can be retrieved easily by providing appropriate query statement (SELECT statement).
- Thus, Data can be accessed in convenient and efficient manner.

Sharing of Data among multiple users

 As database is maintained centrally all authorized user and application program can share database easily.

Allow Implementing Integrity Constraints

- Data in database must be correct and consistent.
- So, data stored in database must satisfy certain types of constraints (rules).
- For example balance in an account should not be a negative value.
- DBMS provides different ways to implement such type of constraints.
- This improves data integrity in a database.

Guaranteed Atomicity

• Any operation on database must be atomic. This means, operation must be executed either 100% or 0%.



• It is the responsibility of the DBMS software to ensure such kind of atomicity. If any operation fails due to some problem such as system crash then effects the partially executed operation can be undone.

Improved Concurrent Access

- Multiple users are allowed to access data simultaneously. This is for the better performance and faster response.
- As database is maintained centrally data can be shared among multiple users. Also concurrent access to centralized data can be allowed under some supervision.
- This result in better performance of system and faster response.

Improved Data security

- Database should be accessible to user in a limited way.
- For example, a customer can check balance only for his/her own account. He/She should not have access to information about other accounts.
- DBMS provides way to control the access to data for different user according to their requirement.
- It prevents unauthorized access to data.
- Thus, security can be improved.

DA (Data Administrator)

• The **data administrator** is a person in the organization who controls the data of the database.

DBA (Database Administrator)

• The **database administrator** is a person in the organization who controls the design and use of the database.

Differentiate the DA and DBA.

DA (Data Administrator)	DBA (Database Administrator)
The data administrator is a person in the	The database administrator is a person in the
organization who controls the data of the	organization who controls the design and the
database.	use of the database.
DA determines what data to be stored in	DBA provides necessary technical support for
database based on requirements of the	implementing a database.
organization.	



DA is involved more in the requirements	DBA is involved more in the design,
gathering, analysis of data.	development, testing and operational phases.
DA is a manager or some senior level person in	DBA is a technical person who havethe
an organization who understands	knowledge of database technology.
organizational requirements with respect to	
data.	
DA does not need to be a technical person.	DBA does not need to be a business person.
DA is a business focused person, but, he/she	DBA is a technically focused person, but,
should understand more about the database	he/she should understand more about the
technology.	business to administrate the databases
	effectively.

Describe functions & responsibility of DBA.

OR

Define roles of DBA.

 Database Administrator is a person in the organization who controls the design and the use of database.

Schema definition

- DBA defines the logical schema of the database. A schema refers to the overall logical structure of the database.
- According to this schema, database will be developed to store required data for an organization.

Storage structure and access method definition

- DBA decides how the data is to be represented in the database.
- Based on this, storage structure of the database and access methods of data is defined.

Defining security and integrity constraints

- DBA decides the security and integrity constraints.
- DDL provides facilities to specifying such constraints.

Granting of authorization for data access

- The DBA decides which user needs access to which part of the database.
- According to this, various types of authorizations are granted to different users. This is required to prevent unauthorized access of a database.



Assisting Application programmers

• DBA provide assistance to application programmers to develop application programs.

Monitoring performance

- The DBA monitors performance of the system.
- The DBA ensure that better performance is maintained by making change in physical or logical schema if required.

Backup and Recovery

- Database should not be lost or damaged.
- The task of DBA is to backing up the database on magnetic tapes or remote servers.
- In case of failures, such as flood or virus attack, Database is recovered from this backup.

Describe Different Types of Users.

OR

Explain Database Users in detail.

Naive Users (End Users)

- Unsophisticated users who have zero knowledge of database system
- End user interacts to database via sophisticated software or tools
- E.g. Clerk in bank

Application Programmers

- Programmers who write software using tools such as Java, .Net, PHP etc.
- E.g. Software developers

Sophisticated Users

- Interact with database system without using an application program
- Use query tools like SQL, MySQL etc.
- E.g. Analyst

Specialized Users (DBA)

- User write specialized database applications program
- Use administration tools
- E.g. Database Administrator

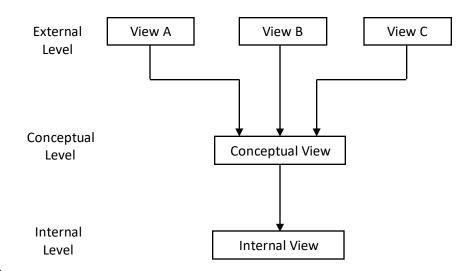


Explain three levels ANSI SPARC Database Architecture. Explain three level Data abstraction.

OR

The ANSI SPARC architecture divided into three levels:

- 1) External level (View level)
- 2) Conceptual level (Logical level)
- 3) Internal level (Physical level)



Internal Level

- This is the lowest level of the data abstraction.
- It describes how the data are actually stored on storage devices.
- It is also known as a physical level.
- It provides the internal view of the physical storage of data.
- It deals with data structure, file structure and access methods.
- It also deals with data compression and encryption techniques.

Conceptual Level

- This is the next higher level of the data abstraction.
- It describes what data are stored in the database and what relationships exist among those data.
- It is also known as a logical level.
- DBA and designers work at this level. Application developers also work at this level. They use some pre-defined data types and data-structure to develop applications.

External Level

- This is the highest level of data abstraction. It is also known as view level.
- It describes only part of the entire database that a particular end user requires.



- It provides end users simple interaction with the system.
- It hides details about data types and data-structure used to develop application at logical level.
- End users need to access only part of a database rather than entire database.
- For example, customers need to access only their own account related information.
- Different users need different views of database.

Advantages of Three-tier Architecture

- Same data can be accessed by different users with different customizes views.
- The user is not conserved about the physical data storage details.
- Physical storage structure can be changed without requiring changes in user's view.
- Conceptual structure of the database can be changed without affecting end users.

Explain Mapping. OR Explain External and Internal Mapping. OR What is Mapping? Describe Types of Mapping.

• The process of transforming requests and results between the three levels is called mapping.

Internal Mapping

- It relates conceptual schema with internal schema.
- It defines correspondence between the conceptual schema and the database stored in physical devices.
- It specifies how conceptual records and fields are presented at the internal level.
- It helps to provide physical data independence. If the structure of stored database is changed, then conceptual/internal mapping must be changed accordingly and conceptual schema remains unaffected.
- There could be one mapping between conceptual and internal levels.

External Mapping

- It relates each external schema (or sub schema) with conceptual schema.
- It defines correspondence between a particular external view and conceptual schema.
- It helps to provide logical data independence. If the structure of conceptual schema is changed, then external/conceptual mapping must be changed accordingly and external schema can remains unaffected.
- There could be several mappings between external and conceptual levels.



When a user requests to access the database following steps are followed.

- User can request in form of query to access database either directly by using particular language, such as SQL or by using some pre-developed application interface.
- Such requests are sent to query evaluation engine via DML pre-compiler and DML complier.
- The query evaluation engine accepts the query and analyses it.
- It finds the suitable way to execute the complied SQL statements of the query.
- Finally the complied SQL statements are executed to perform the specified operation.

Explain Functions and Services of DBMS

- **Data Storage:** Provides a permanent storage for data on physical devices. It manages the storage space allocation and de-allocation.
- **Data Manipulation:** Provides data manipulation functionality such as insert, update, delete and retrieval of the data.
- **Data Dictionary:** Manages data dictionary to store the metadata.
- **Communication Interface:** Provides interaction between user request and database. User request can be either from application programs or directly by using SQL statements.
- **Security:** Ensures that only authorized users having sufficient privileges can access data stored in database to prevent misuse of the data.
- **Back-up and Recovery:** Provides ways to back-up data periodically and recovering from different types of failures.
- **Concurrency Control:** Controls the concurrent access of the same data among multiple users.
- **Transaction Management:** Ensures the atomicity of the transactions to maintain consistency of the data.
- **Data Independency:** The acquired skill to change a conceptual pattern by not affecting the conceptual pattern of the next superior level is defined as the data independence.

✓ Logical Data Independency:

- Logical data independence is the ability to modify the conceptual schema without having affected in external schemas or application programs.
- Alterations in the conceptual schema may include addition or deletion of fresh entities, attributes or relationships and should be possible without having alteration to existing external schemas or having to rewrite application programs.

✓ Physical Data Independency:

 Physical data independence is the ability to modify the inner schema without having alteration to the conceptual schemas or application programs.



 Alteration in the internal schema might include: Using new storage devices, Using different data structures, Switching from one access method to another, Using different file organizations or storage structures, Modifying indexes.