# (Model Question & *Answer* )
# Government Arts College - Ariyalur
# B.Sc Computer Science 4th Semester
# Database Systems

## Part A- *Two marks*

1. **What do you mean by a database?**

A database is a collection of data, or information, that is specially organized for rapid search and retrieval by a computer. Databases are structured to facilitate the storage, retrieval, modification, and deletion of data in conjunction with various data-processing operations.

2 **What is a table?**

A Table is composed of rows and columns. Each row of the table is called as tuple. Each column of the table is called as attribute. A table is also called as Relation. A table contains a group of related entities.

3 **What is a field?**

Every table is broken up into smaller entities called fields. The fields in the CUSTOMERS table consist of ID, NAME, AGE, ADDRESS and SALARY. A field is a column in a table that is designed to maintain specific information about every record in the table.

4 **What is a NULL value?**

A NULL value in a table is a value in a field that appears to be blank, which means a field with a NULL value is a field with no value.

It is very important to understand that a NULL value is different than a zero value or a field that contains spaces. A field with a NULL value is the one that has been left blank during a record creation.

5 **What is a Primary Key?**

A column or group of columns in a table which helps us to uniquely identifies every row in that table is called a primary key. This DBMS can't be a duplicate. The same value can't appear more than once in the table.

6 **Define instance and schema?**

Instance: Collection of data stored in the data base at a particular moment is called an Instance of the database.

Schema: The overall design of the data base is called the data base schema.

7 **Define the terms i) Entity type ii) Entity set**

**Entity type:** An entity type defines a collection of entities that have the same attributes.

**Entity set:** The set of all entities of the same type is termed as an entity set.

## Part B- *Five marks*

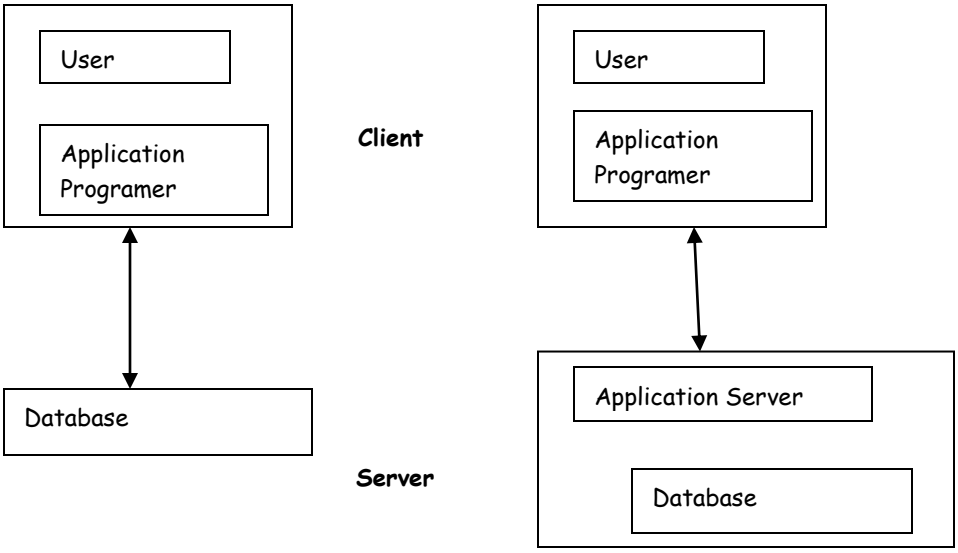
**1. Explain the DBMS Architecture**

i. The main aim of database system is to provide an abstract view of data hiding of certain detail of how data is stored. And manipulated, to satisfy these needs to develop architecture for database system.

ii. In early days the whole DBMS package was a single package where as modern DBMS is based on client-server architecture.

iii. Under the client-server architecture the database is not present in the client machine. But the client machine connected to the database system through Network and server.

There are two types of DBMS architecture as shown below.



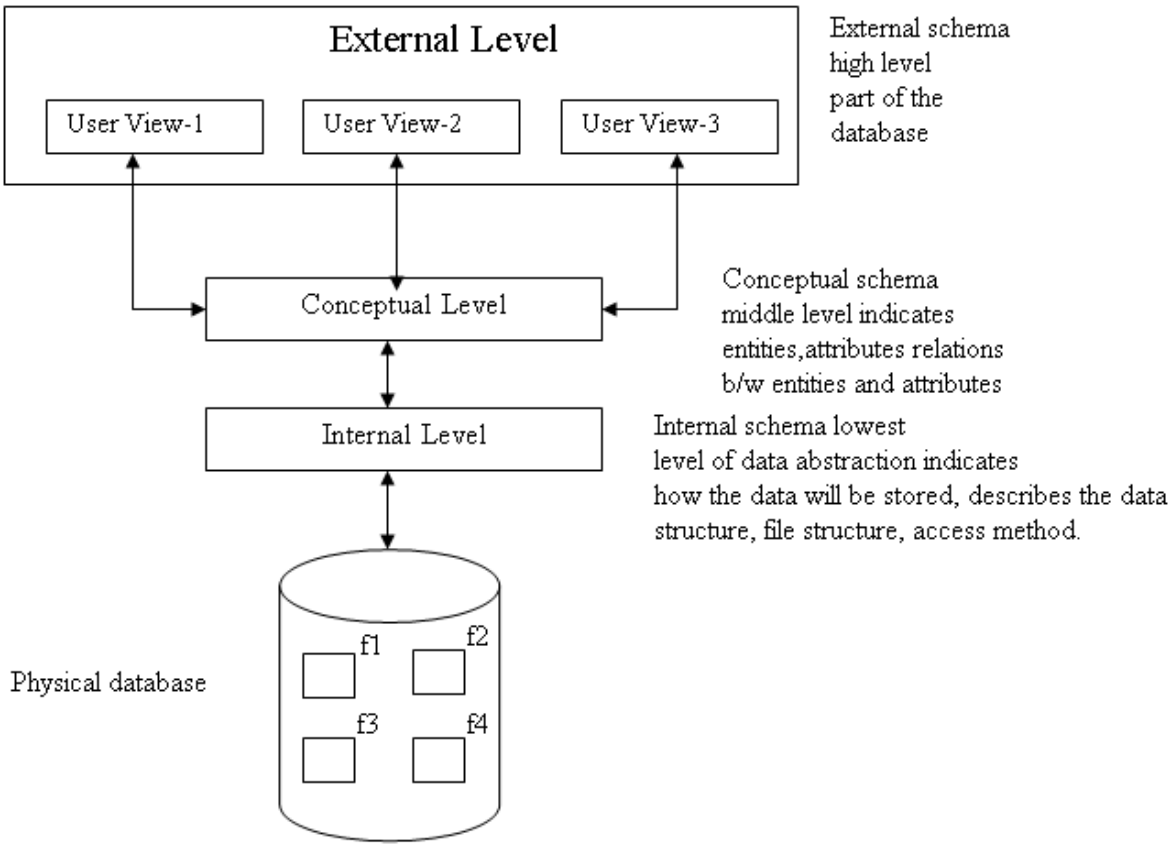

**Two Tire Architecture** **Three Tire Architecture**

In two-tier architecture, the application is a component that resides on the client machines that communicate server machine through query language statements.

In three-tier architecture, the client machine cannot directly communicate with an application server, the application server communicates with a database to access data. Three tier architectures are more suitable for large applications.

## 2. Explain the Database Architecture

A database Architecture is shown below depending upon the three tier architecture. It contains of 3 levels.




**Internal level**

The internal schema defines the internal level. The internal level is the lowest level of data abstraction. This level indicates how the data will be stored into the database and describes the file structures and data structures and methods to be used by the data base.

**Conceptual level**

The conceptual schema defines the conceptual level. The conceptual level in the middle level abstraction. This level indicates entities, attributes, relationship between entities and attributes.

**External level**

External schema defines the external level. The external level is the highest level of data abstraction. This level describes part of database. i.e., relevant to the user.

## 3. What are the Functions or services of DBMS ?

The functions and services of DBMS are

1. **Data storage Management**

DBMS creates the structure for database in the physical storage devices. It provides a mechanism for permanent storage of dat.

2. **Data Manipulation Management**

The DBMS provides ability to add new data into the database (or) retrieve, update and delete existing data in the database.

3. **Data Definition Management**

The DBMS creates the structure of data in which the data is stored.

4. **Data dictionary**

The DBMS provides a data dictionary in which stores the description of data items.

5. **Authorization**

The DBMS protects the database against unauthorized access either intentional (or) accidental.

6. **Backup and recovery**

The DBMS provides a mechanism for Backup data periodically and recovery from different types of failures.

7. **Concurrency control**

The DBMS supports sharing of data among multiple users. The DBMS provides a mechanism for concurrent access to the database.

8. **Transaction Management**

The transaction in a series of database operations, which access (or) changes the content of the database. This is done by the transaction management.

9. **Data Independency Service**

The DBMS supports the independency of the programs from its structure of the database.

10. **Integrity Service**

The DBMS provides integrity service to store the data into the database (or) to change the data into the database follows certain rules.

## 4. What are the Functions database Administrator ?

Database administrator is an individual person with an overview of one (or) more databases and also controls the design and use of database.

Functions and responsibilities of DBA are

1. **Defining conceptual schema and database creation**

The DBA creates the conceptual schema such as defining entities and attributes, deleting entities and attributes and modifying entities and attributes etc. The DBA also creates the structure of the database.

2. **storage structure and access method definition**

The DBA defines the storage structure of the data. And access methods of the database.

3. **Granting authorization to the user**

The DBA grants the access to use the database to its users. The authorization information is kept is a system, the database system consults whenever someone attempt to access the data in the system.

4. **Routine maintenance**

The DBA maintains periodically backups of the database either on hard disc (or) CD to prevent loss of data in case of failure.

5. **Job monitoring**

The DBA is responsible for the performance of data is not decreased.

## Part C- *Ten marks*

### 1. Purpose of Database System

Traditionally, file processing system was used to manage information. It stores data in various files of different application programs to extract or insert data to appropriate file. File processing system has several drawbacks due to which database management system is required. Database management system removes problems found in file processing system. Some of the major problems of file processing systems are:

**i. Data redundancy and inconsistency:**

In file processing system, different programmer creates files and writes application programs to access it. After a long period of time files may exist with different formats and application programs may be written in many different programming languages. Moreover, same information may be duplicated in several files. We have to pay for higher storage and access cost for such redundancy. It may leads database in inconsistent state because update made may be reflected in one file but it may not be reflected in another files where same information exist in another files.

**ii. Difficulty in accessing data:**

In file processing system, we can not easily access required data stored in particular file.For each new task we have to write a new application program. File processing system can not allow data to be retrieve in convenient and efficient manner.

**iii. Integrity problem:**

In database, we required to enforce certain type consistency constraints to ensure the database correctness or to enforce certain business rules. It is in fact called integrity constraints (e.g. account balance > 0), integrity of database need not to be violated. In file processing system, integrity constraint becomes the part of application program.

Programmer need to write appropriate code to enforce it. When new constraints are required to add or change existing one, it is difficult to change program to enforce it.

**iv. Atomicity problem:**

Failures may lead database in an inconsistent state with partial updates. For example, failure occurs while transferring fund from account A to B. There would be the case that certain amount from account A is retrieved and it is updated but failure occurs just before it is deposited to account B, such case may lead database in inconsistent state.

**v. Concurrent access problem:**

Concurrent accessed increase the overall performance of system providing fast response time but uncontrolled concurrent accesses can lead inconsistencies in system. File processing system allow concurrent access but it is unable to coordinate different application programs so database may lead in inconsistent state. E.g. two people reading a balance and updating it at the same time.

**vi. Security problem:**

Since file processing system consist large no. of application programs and it is added in ad hoc manner. So it is difficult to enforce security to each application to allow accessing only part of data/database for individual database users

## 2. Data Abstraction:

Data abstraction is the technique of hiding the complexity of the database to its users. There are three levels of data abstraction which are discussed below.

• **Physical Level or Internal Level:**

It is the lowest level of abstraction and describes *how* the data in the database are actually stored. This level describes complex low-level data structures in detail and is concerned with the way the data is physically stored. Data only exists at physical level.

• **Logical Level or Conceptual Level:**

This is the next higher level of abstraction and describes *what* data are stored in the database, and what relationships exist among those data. It describes the structure of whole database and hides details of physical storage structure. It concentrates on describing entities, data types, relationships, attributes and constraints. All of the views must be derivable from this conceptual schema.

• **View Level or External Level:**

It is the highest level of abstraction and is concerned with the way the data is seen by individual users. This level simplifies the users' interaction with the system. It includes a number of user views and hence is guided by the end user requirement. It describes only those part of the database in which the users are interested and hides rest of all from those users. Each user group refers to its own external schema.

Example:

*view level*

- View result
- View student information

*logical level: entire database schema*

- Courses (CourseNo,CourseName,Credits,Dept)
- Student (StudentID,Lname,Fname,Level,Major)
- Grade (StudentID,CourseNo,mark)

*physical level:*

- how these tables are stored, how many bytes it required etc.

The DBMS must transform a request specified on an external schema into a request against the conceptual schema, and then into a request on the internal schema for processing over the database. The process of transforming requests and results between levels is called mapping.

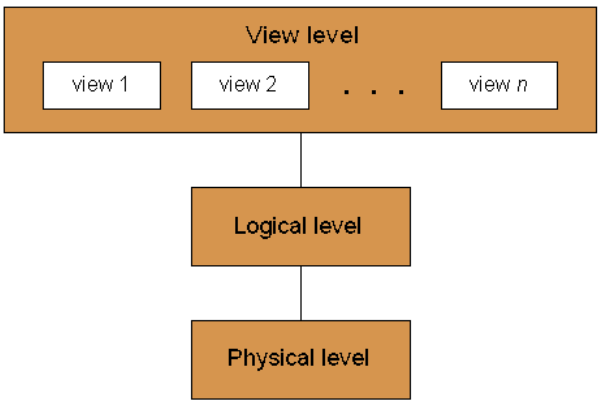



**Fig : Data abstraction level**