**Sub: Database Management System**

**Unit-1**

**Database management system (DBMS):**

DBMS is a collection of programs that enable user to create and maintain a database. DBMS is general purpose software that facilitates the process of defining, constructing and manipulating a database.

It is a software for storing and retrieving users' data while considering appropriate security measures. It consists of a group of programs which manipulate the database. The DBMS accepts the request for data from an application and instructs the operating system to provide the specific data. In large systems, a DBMS helps users and other third-party software to store and retrieve data.

DBMS allows users to create their own databases as per their requirement. The term “DBMS” includes the user of the database and other application programs. It provides an interface between the data and the software application.

**DBMS allows users the following tasks:**

* **Data Definition:** It is used for creation, modification, and removal of definition that defines the organization of data in the database.
* **Data Updation:** It is used for the insertion, modification, and deletion of the actual data in the database.
* **Data Retrieval:** It is used to retrieve the data from the database which can be used by applications for various purposes.
* **User Administration:** It is used for registering and monitoring users, maintain data integrity, enforcing data security, dealing with concurrency control, monitoring performance and recovering information corrupted by unexpected failure.

**Advantage of database management system:**

**1) Controlling redundancy (delicacy):**

In traditional files processing every group of user maintains their own files for controlling its data processing application. This redundancy in storing the same data multiple time leads to several problem.

**2) Restricting unauthorized users**:

When multiple users share the same database it is likely that some user will not be authorized to access all information in the database. For e.g. financial data is often considered confidential and so only authorized person are allow accessing such data. In addition some users may be permitted only to retrieve data where as others are allow both retrieves and update.

**3) Enforcing integrity constraints:**

Most database application has certain integrity constraints that must hold for the data. A DBMS will provide capabilities for defining and enforcing these constraints the simplest type of integrity constraints involves specifying the data type for each data items.

**4) Providing backup and recovery**:

A DBMS must provide facilities for recovering from hardware and software failures. The backup and recovery subsystem of DBMS is responsible for this purpose.

**5) Representing complex relationship:**

A database may include wide variety of data that are interrelated in many ways. A DBMS must provide facilities for representing complex relationship among the data as well as to retrieve and update the related data efficiency.

**6)Providing multiple user interfaces**:

Because many type of user with varying level of technical knowledge use a database. A DBMS should provide variety of user interfaces for different type of user.

**Database:**

A database is a collection of related data. By data we mean known fact that can be collected and recorded and that have implicit meaning. A database is centrally controlled, integrated, collection of logically related data to manage an organization. A database may be generated and maintained manually or it may be computerized.

**Characteristics of database approach:**

**1) Self-describing nature of database**:

The database system contains not only the database itself but also a complex definition or description of database structure and various constraints on the data. This definition is stored in system catalysts which contain information such as structure of each file, data type and various constraints. The information stored in system catalysts are called Meta data and it describes the structure of primary database.

**2) Support of multiple views of data:**

A database has many users each of who require different views of a database. A view may be subset of database or it may contain virtual data that is desired from the database.

**3) Showing of data and multi-user transaction processing:**

A multi-user DBMS must allow multiple users to access the database at the same time, this is essential when the data for multiple application is to be integrated and maintained in a single database. The DBMS must provide concurrency control technique to ensure that several users trying to update the same database do so in a control manner that the result of update is correct.

**Data and information:**

Data are values of qualitative or quantitative variables, belonging to a set of items. Data in computing are representing in a structure, often tabular, a tree or a graph structure. Data are typically the results of measurements and can be visualized using graph or images.

Information, in its general sense is knowledge communicated or received concerning a particular fact of or circumstance. Information cannot be predicted and resolves uncertainty. The uncertainty of an event is measured by its probability of occurrence and is inversely proportional to that, the more uncertain is required to resolve uncertainty of that event. The amount of information is measures in bits.

**Centralized and Distributed database:**

A centralized database has all its data on one place. As it is totally different from distributed database which has data on different places. In centralized database as all the data reside on one place so problem of bottle-neck can occur and data availability is not efficient as in distributed database.

A distributed database is a database that is under the control of a central database management system in which storage devices are not all attached to a common cup. It may be stored in multiple computers located in the same physical location or may be dispersed over a network of interconnected computers. Collections of data can be distributed across multiple physical locations. A distributed database can reside on network servers on the internet, on corporate intranets or extranets or on other company network.

**Database Administrator (DBA):**

A database administrator is a person responsible for the installation, configuration, upgrade, monitoring and maintained of database in an organization. The roles include the development and design of database strategies, system monitoring and improving database performance and capacity and planning for future expansion requirements. They may also plan, co-ordinate and implement security measures to safeguard the database.

**Data model**:

Data model is a collection of concept that can be used to describe the structure of a database. By structure of a database we mean data types, constraints and relationship that exit among the data. Most data model also include a set of data which is operation for specifying the retrieval and update on a database.

**Types of data model:**

There are 3 types of data model

**1) High level or conceptual data model:**

It provide concept that is understood by people who are not computer profession.

**2) Low level or physical data model:**

It provides concept that describes the detail of how the data are stored in a computer. Concept provide by low level data model are generally meant for computer specialist and not for the end user.

**3) Representational or implementationl model:**

Between the high level and low level data model there is a class of representational or implementation data that provide the computer that are understood by the end user and that are removed from the way data is organized within the computer

**Schema and Instance**

The overall logical design of a database is called schema. The schema description will have name of their record type, data type, size and various constraints on the data item.

A database changes over time when the information is insertion or deleted. The collection of information stored in a database at a particular moment of time is called instance of database. For e.g. database for student changes every time when new student are inserted and outgoing student are deleted from database.