

## **Lesson 2. Database Concept**

### **1. What is Data?**

The sensible or insensible raw fact like a number, text, picture, symbol audio, video, place, any person, event or thing is called Data. They are the base of processing system to obtain meaningful or sensible information. Sometime, information of a system also can be a raw fact for another system. Usually, they cannot give complete information and they should be processed to get meaningful information. Example: Ram, 20, Pokhara.

### **2. What is Information?**

The result obtained after processing raw data is called Information, which gives meaningful sense to the users. Generally, they should be simple and

easy to interpret by the users. Example: Ram is of 20 years, who lives in Pokhara.

### **3. What is Database? Write the types of them.**

The organized collection of related data is known as Database. They are organized, so that the users can get them easily for processing to get actual information. The organized collection of the numbers, place names, names of people, marks, records of students, etc. are some examples of database. There are basically two types of database. They are:

#### **a) Manual Database**

The database kept on the papers or files is called Manual Database. They are known as Flat File or File Based

Database. They are difficult to manage and update. They often produce the duplication and inconsistency of data. They are very limited to answer the various queries. But they can be first phase of database management for the computerized database.

#### b) Computerized Database

The organized collection of related data in computers using any DBMS software is called the computerized database. They are the modern concept of managing database for quick processing and for producing quick result of the queries. They are easy to enter, edit, delete and update, so they have become very essential tool for any organization. Record keeping of students in schools, hospitals, medical stores, companies,

banks, electronic dictionaries, encyclopedia, etc. are some examples of Computerized Database.

#### **4. What are the advantages of Computerized Database over Flat File system or Paper based Database?**

There are many advantages of Computerized Database. Some of them are:

- i. Easy to manage the data like entering, deleting, updating, etc.
- ii. Easy query facility
- iii. Reduction of data redundancies
- iv. Data sharing facility
- v. Possibility of multiuser environment
- vi. Easy recovery system from the backup
- vii. Easy data access
- viii. Interactive user interfaces

- ix. High accuracy of data entry
- x. Possibility of merging records, etc.

**5. What is DBMS? Write the types of them.**

DBMS stands for Database Management System, which is a type of software to manage the database in computers. They are very helpful to enter, edit, copy, delete and update the records in database. Also, they are capable of giving quick response of the user queries. Also, they support interactive user interface and more samples to analyze the stored records. Ms-Access, FoxPro, Ms-SQL, My-SQL, Oracle, dBASE, etc. are some examples of DBMS software. Though there are various types of DBMS, they can be classified on the following categories:

- a) Relational Database Management System (RDBMS)
- b) Object Oriented Database Management System (ODBMS)
- c) Distributed Database Management System (DDBMS)
- d) Hierarchical Database Management System (HDBMS)

**6. What are the advantages/objectives/uses of DBMS and disadvantages of DBMS software?**

The advantages of DBMS software are:

- i. Easy for storing, editing, copying, deleting, updating and printing records
- ii. Reduces data redundancy
- iii. Provides mass storage facility
- iv. Provides data sharing facility

- v. They support multi-user environments in the Network
- vi. Interactive user interfaces
- vii. High secure of data
- viii. They can maintain
- ix. Easy query system
- x. Easy to search the data

Disadvantages of DBMS software are:

- i. Expensive investment
- ii. Complex to understand and implement, so, the skilled man power is required, which increases the cost operation
- iii. Fast changing of the technology affects the system
- iv. High possibility of data piracy and hacking
- v. Cost of hardware and software maintenance increases

vi. Machine dependency can sometime cause the terrible problem in the organization like data loss of many years

### **7. What is Database Model? Define and write the types.**

The design or procedure to define the structure or the model of a database for storing, accessing and describing the data is called Database Model. It describes the no of tables, data types, query types, user interfaces, reports, relationships and constraints (limitations or restrictions) of the data and its users, etc.

#### **Purpose of Database Modeling**

- i. To design the fully normalized database
- ii. To reduce the data redundancy or duplication



- iii. To improve performance of database
- iv. To establish relationship between tables
- v. To make the database more reliable providing high security of stored data
- vi. To create easy queries and reports

The types of Database model are:

- i. Hierarchical Model
- ii. Network Model
- iii. Relational Model
- iv. Entity Relationship Model

**8. Define Hierarchical Model of Database. List out its advantages and disadvantages, too.**

It is one of the oldest models of database design developed by IBM in the 1960s. In this model, the logical

relationship is created among the data or files used in the database, in a hierarchical order. In this hierarchy, data are stored from the root, nodes or trunks and up to the leaves. It can be known as the top-down structure or upside-down tree structure of the database model. All records in hierarchy are called nodes and each node is related to other files or data in a parent-child relationship. Each parent record can have one or more child records but each child record will have only one parent record. Similarly, the top level record of the hierarchy is called root record.

**Advantages:**

- i. Easiest model of database design

- ii. Child records are more secure, which makes the whole database secure
- iii. Searching fast
- iv. Helps to create 'One-to-many' relationship
- v. It helps to build complex system from simple components

**Disadvantages:**

- i. It is an old outdated database model
- ii. Impossible to modify the child records without touching parent record, so it is not flexible
- iii. It cannot handle 'Many-to-Many' relationship
- iv. It increases data redundancy because same data can be kept in different parents

v. When parent node or parent record is deleted, all the children nodes will also be deleted automatically

**9. Define Network Database Model. List out them with their advantages and disadvantages.**

This model is modified version of the Hierarchical Database Model developed by Charles Bachman. In this model, one child node can have more parent nodes, where in the hierarchical model, one child record would have only one parent node. By this design, the child node can be accessed from any parent nodes, which causes to increase the flexibility of database operation. It forms the multidimensional link structure among the records.

**Advantages:**

- i. More flexible
- ii. Reduces data redundancy because same data is not stored in different parent records.
- iii. Searching is faster by the multidirectional pointers, which means the records can be searched from any parent record.

**Disadvantages:**

- i. It is complex for modeling
- ii. It needs larger programs to handle the relationships
- iii. Large memory consumption
- iv. Less secure than hierarchical model because it allows multi-access facility of records

**10. Define Relational Database Model. List out the advantages and disadvantages of it.**

This is a very popular database model, in which the data are arranged or stored in two-dimensional tables called 'Relations'. The column of a table or relation is known as field or attribute and the row is called record or tuple. A field can give incomplete information or it gives a piece of information, whereas a record gives complete information. It was developed by E.F. Codd. This model can handle 'Many-to-Many' relationship.

Advantages:

- i. Easy to understand
- ii. Easy to create 'Many-to-Many' relationships among the records
- iii. Very less data redundancy or duplication

iv. Normalization of database is possible

v. Very easy to store and modify the records

Disadvantages:

i. More complex due to many to many relationships

ii. Too many rules make non-user friendly

iii. Normalization of database require a good knowledge of normalization

iv. Wrong relationships create wrong operation

v. The function of Action queries cannot be recovered, even in the case of mistake

## **11. Define Entity, attributes and relationship.**

An entity is a name of physical or conceptual group of things or persons

or objects in the real world with unique attributes or characteristics. For example, the term 'student' can be an entity and roll no, name and class can be its attributes or characteristics, which distinguishes it from other entities in the world. Similarly, book, result, teacher, employee, etc. can be the entities.

Similarly, attributes mean the characteristics or the descriptive elements of an entity. In the above example, roll no, name and class are the attributes of 'student' entity. Further, code, name and salary can be the attributes of the entity 'employee', and BookID, name and price can be the attributes of the entity 'book'.

Finally, the term relationship is used to show the association or link



between the common records of different tables of a database. There are One-to-One, One-to-Many and Many-to-relationships.

## **12. Define Primary Key, Candidate Key and Composite Key.**

**Primary Key**: It is a feature of DBMS, which uniquely identifies the records in a database. It means it does not allow the duplicate records in a database. Also, it avoids the Null value, which creates confusions and error reports in database. This feature is applied in such a field, which cannot be repeated. For example, the code numbers of students in a school cannot be repeated. By the code number, the student records can be controlled. So, code field is selected to be Primary key.

**Candidate Key:** Candidate keys are the set of all the possible primary key fields in a table. In many cases, a table or relation can have more possible primary key fields, which can uniquely control the records. For example, the student records of a class can be handled by the code numbers of the students, as well as by the roll numbers of them. Because, as the code numbers cannot be repeated in a class, roll numbers also cannot be repeated. So, in this case, both keys are the candidate keys until we select one of them. It means, we can choose any one of them to be primary key, or both.

**Composite Key:** Composite key is the combination of two or more than two primary keys or key fields. For the creation of composite key, we should

select the multiple candidate keys and click on primary key button or option.

**13. What is the term 'Normalization'? List out the types of it.**

The process of converting a complex database table into many normal or simple tables is called Normalization. It is done to reduce the data duplication called redundancy and to avoid the errors or contradictions called data inconsistencies.

The common normal forms are:

- i. First Normal Form (1NF)
- ii. Second Normal Form (2NF)
- iii. Third Normal Form (3NF)
- iv. Boyce-Codd Normal Form (BCNF)
- v. Fourth Normal Form (4NF)
- vi. Fifth Normal Form (5NF)

Note: In your level, you will learn only up to 1NF, 2NF and 3NF.

#### **14. Define 1NF, 2NF and 3NF.**

**1NF** If a table has no duplicate records or multiple data in the same cell, it is in 1NF or First Normal Form. It means, all the cells of a table or relation should have unique records or atomic records.

**2NF** To be in 2NF, the table already should be in the 1NF, means no duplicate or multiple data in the same cell and further there should be functional dependencies of non-key attributes or fields of a table up on the primary key field. It is necessary to take control of the database.

**3NF** To be in the 3NF, the table already should be in the 2NF and

further, non key columns or fields should not depend up on each other.

## **15 What is Database Language?**

The language or the set of terms used for the management of the database is called Database Language. They are basically of three types: DDL, DML and DCL.

DDL stands for Data Definition Language, which is used by the designers and programmers to specify the structure of the database. It is a standard for the use of commands to create, modify and remove database and database objects. CREATE, ALTER and DROP are the DDL used by SQL.

DML stands for Data Manipulation Language, which is used to work with the database records. SELECT, INSERT,

UPDATE and DELETE are the DML statements of SQL.

DCL stands for Data Control Language, which is used to apply the control on the database. GRANT, DENY and REVOKE are the DCL statements of SQL.

### **16. What is SQL? Write its features.**

SQL stands for Structured Query Language, which is the most popular database language in present. It is used for controlling the database. In the beginning, SQL was called SEQUEL, which means Structured English Query Language designed by IBM. SQL-92 is the certified version of SQL by ANSI and ISO. But now different companies have used SQL for their relational database with some new features in comparison to each others.

Ms SQL, My SQL, T-SQL, P-SQL, etc. are some examples of different versions of SQL used by different companies.

The common features of SQL are:

- i. It is non procedural language.
- ii. It is English-like language.
- iii. It can process a multiple records at a time.
- iv. It is 4<sup>th</sup> GL.
- v. Easy to use for creating database tables and queries.

**17. Who is DBA (Database Administrator)? What are the responsibilities of him?**

DBA is the person, who is assigned to take care of over all the activities of the DBMS of an organization. Mostly, the database designer and developer can be the DBA of an organization but any other individual who have

sufficient knowledge of programming languages, database designing and operating system, in which the database runs, also can be the DBA. The responsibilities of a DBA are as follows:

- i. Designing, installing and upgrading database server
- ii. Monitoring the database server and its integrity rules
- iii. Providing high security to the database server
- iv. Performing backup and recovery of data
- v. Scheduling database managements
- vi. Coordinating with the developers
- vii. Transferring data in the network
- viii. Providing 24 hours service to the users



## **18. What are the qualities of a good DBA?**

DBA is a highly responsible person to manage DBMS in an Information System of any organization. He is a coordinator in between technical and non-technical man-power of an organization. So, to manage the top to bottom man-power and Information System, he should have the following qualities:

- i. He/She should have depth knowledge of all the operating system in the market.
- ii. Depth knowledge of SQL is required.
- iii. He/She should be a good database designer, too.
- iv. He/She should have sound knowledge of network architecture.

v. Should have a good control on Database Server.

**19. Discuss the differences between centralized and distributed database with their advantages and disadvantages.**

Computerized database systems are of two types on the basis of their functions and the locations they exist. They are Centralized Database and Distributed Database. Centralized database is designed to store the data in a central server and other clients should depend up on the server for data sharing. It is used in Centralized Network Architecture, which is the concept of storing and accessing the data in control of the central machine. Central machine is connected with many terminals for input and output

but the processing and storing is done in central machine. Similarly, it is used in Client/Server Network Architecture, too, but in a local area only, where clients share the data with the server computer. In this design, the data security is not very crucial because they can be easily maintained, as they are in the local structure. And the disadvantage of this design is that the data cannot be accessed from any location.

On the other hand, Distributed Database is designed to store data in many locations all over the world and to access from any location of the world. It is used in Metropolitan Area Network and Wide Area Network. In this design, data can be accessed from any location and the data is stored

spreading in different locations with the same name. But the disadvantage of this design is that the data can be copied or hacked or destroyed by the hackers. So, the data security gets the first priority in this design.

**20. What is Ms Access? List out the features of it.**

Ms Access is a RDBMS software developed by Microsoft Corporation, USA. It is one of the different software of Ms Office Package. It is an office automation tool. It is called RDBMS because it stores and access the data from the tables made up of rows and columns in intersection of each other. The tables are created separately for each entity, which refers to the group of any items, things or persons. So, they are sometime called entity, too,

like the table of students' records can be called Student entity, table of teachers' records can be called Teacher entity, etc. Similarly, the tables are called as Relation, too, as the fields of a table are related to each other to complete the object or the purpose of an entity creation. Actually, the concept of RDBMS has come through this term, where the data is stored in the relations. In addition, the columns of a table are called as Fields or Attributes and the rows are called the Records or Tuple. A field can give a piece of information, where a record can give a complete information.

Ms Access has different versions like Ms Access 97/2000/2003/2007, etc. The features of Ms Access are as follows:

- i. Stores data in the tables
- ii. Simple to use and understand
- iii. Easy to enter, update and modify the records
- iv. It provides useful queries
- v. Attractive user interface and reports can be designed
- vi. Data security is high
- vii. One of the popular office tool of Ms Office Package
- viii. Easy to install and remove

## **21. What are the objects of Ms Access?**

The objects of Ms Access are:

- i. Table
- ii. Query
- iii. Form
- iv. Report
- v. Pages
- vi. Macros
- vii. Modules

## **22. What are the data types used in Ms Access?**

There are ten data types used in Ms Access before the 2007 versions. They are:

- i. Text
- ii. Memo
- iii. Number
- iv. Date/Time
- v. Currency
- vi. AutoNumber
- vii. Yes/No
- viii. OLE Object
- ix. Hyperlink
- x. Lookup Wizard

But from the 2007 version, one more data type has been added i.e. Attachment.

### **23. What is Table?**

It is an object of Ms Access, which is used to store the data. It is the foundation of any RDBMS software. It is made up of rows and columns intersecting each other. The table can be said relation or entity, too. The columns are called an attribute or field

and the rows are called the records or tuples, too. The table can be created by three ways – Table Wizard, Datasheet view and Table Design view.

## **24. What is Query?**

It is an object of Ms Access to access the data from the tables. It is used for calculating, selecting, deleting, modifying and updating the records from the tables. There are different types of queries but they can be classified in two major groups – Select Query and Action Query. Select Query does not make any change over the table. They extract the records from the tables and displays separately on the basis of the selection criteria. On the other hand, the Action Query makes changes over the table records. Delete Query, Append Query and



Update Query are the examples of Action Queries. Query can be created from Query Wizard and Query Design View.

#### **24. What is Form?**

It is an interface of Ms Access to enter, modify and view the records of its base table. The base table means the table, on which the form is created. Forms can be created by AutoForm Wizard and Design View.

#### **25. What is Report?**

Report is an object of Ms Access to print the records of tables and queries. It provides formatting printing facility, too. It can be created by Report Wizard and Report Design View.

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