Unit
14

INTRODUCTION TO DATABASES

UNIT STRUCTURE

14.0 Learning Objectives :

After working through this unit, you should be able to :

- Understand the database system.
- State the hierarchy of data into the database
- List the advantages and disadvantages of the database
- Learn validation of data into the database
- List and explain types of databases

14.1 Introduction :

A database is a collection of data organised in a manner that allows user to access, retrieval and use that data. Database can store different types of data such as text, numbers, date, images, audio and video. A database is generally used to store large amount of data pertaining to a particular system for example, School Management System, Payroll System, Library Management System and so on.

Database Management System (DBMS) is a software which allows user to create and manage database. DBMS systems allows user to store the data into database, to retrieve the data, to sort the data. With the help of DBMS system user can add, modify and delete the data into the database. MS–Access, Oracle, MySQL, and MS–SQL Server are examples of DBMS products.

14.2 Hierarchy of Data :

Data is organized in different levels. Each higher level of data consisting of one or more lower level of data.

- **Character :** Character is a collection of 8–bits, which is used to represent any one symbol of a keyboard. It can be alphabets, digits or special symbol.
- **Fields :** A Field is a combination of one or more character. For Example, Roll number of a student, Mobile number or Email address of the customer, ISBN number of a book are example of fields. To maintain integrity, you need to assign a data type when you are defining field. Datatypes include Text, Numbers, Boolean (Yes/No), Date etc. For example, if you have chosen date datatype to the field 'DateOfBirth', then DBMS will not allow any Invalid date in this field at the time of data entry.
- **Records :** A record is a group of related fields. For example : data of (RollName, Name, DateOfBirth, Address) of any one student is a record of that particular student.
- **Data Table / Data File :** Collection of related records is called Data Table or Data File. For example, if the class has 60 students, then Data table should have 60 records.. Each record represents a data of one student that might have (RollName, Name, DateOfBirth, Address) fields.

❑ **Check Your Progress – 1 :**

1. Oracle is an example of _____.

   [A] Word processor [B] Presentation tool

   [C] DBMS [D] None of the above

2. Collection of related records are called _____.

   [A] Field [B] Character

   [C] Record [D] None of the above

3. Collection of related fields is called _____.

   [A] Field [B] Character

   [C] Record [D] None of the above

14.3 Validation of Data :

Validation of the data means comparing the data entered by the user with some set of rules or values. The data entered by the user should meet to some specific criteria. If the data fails to validity check, then the DBMS system should not allow to accept such data, and it shows error message to the user. Here, some examples are given for the validation of data.

- **Alphanumeric Check :** Alphabetic check constrain ensures that the data entered by the user has only alphabets into the field. Numeric check constrain ensures that the data inputted into the field contains only digits. For example, in the field of customer's mobile number we don't want to allow any alphabets to be inputted by the user.
- **Range Check :** Range constrain of DBMS system ensures that the data to inputted by the user should follow some range. For example, in the employee table, Age field must take data from 18 to 60.
- **Referential Integrity Check :** Referential Integrity also known as consistency check. Here, DBMS checks that the data inputted by the user is consistent with other related data tables or not. For example, in the 'Salary' table you must not allow to do data entry of the Employee, which does not exist in the 'Employee' table.

- **Required Field Check :** Required field check verifies that user must input the data into some designated field. You can set the rule in the DBMS, such that 'Employee Name' is mandatory and user must have to enter details into this field while entering Employee details.

❑ **Check Your Progress – 2 :**

1. To enforce user to enter Employee name mandatorily, _____ check will be used.

   [A] Range [B] Required field

   [C] Referential integrity [D] None of the above

2. _____ check is used to validate age filed for the employee.

   [A] Range [B] Required field

   [C] Referential integrity [D] None of the above

3. To check whether the Employee is a valid employed, while entering a salary details of the employee, _____ is used to validate data.

   [A] Range [B] Required field

   [C] Referential integrity [D] None of the above

14.4 Advantages of A Database :

The concept of Database serves many advantages and disadvantages. Advantages of Database are listed below :

1. **Reduce data redundancy :** Data redundancy means unnecessary duplication of data. If the data is redundant then it causes inconstancy as well as it takes more storage space to store, unnecessarily duplicate data. When we are storing data into the database then we are following some rules called normalization. Normalization is a process of splitting the table into multiple tables to avoid redundancy.
2. **Improve data integrity :** Integrity means validation of the data. When we create a field, we need to specify data type for that field. Not only that DBMS applications allow us to specify validation rules. When user enters a wrong data, which do not match with data types or validation rules, database refuse to take that invalid data from the user.
3. **Sharing of data :** Database allows user to share the data. Online banking, and Railway reservation systems are great examples of data sharing of database.
4. **Ease Access :** It is very easy to access the data from the database. Even if non–technical user can also access the data from the database with minimal effort.
5. **Reduction in development time :** User of database will ease the development process. Application developer can easily access the data from the databases. Many DBMS system provides several tools to assists in developing program, which further reduces the time of development process.

❑ **Check Your Progress – 3 :**

1. Unnecessary duplication of the data is called _____.

   [A] Data redundancy [B] Data integrity

   [C] Referential integrity [D] All of the above

2. Validation of the data entered by the user to the database is called _____.

[A] Data redundancy [B] Data integrity

[C] Referential integrity [D] All of the above

3. Use of database provide _____ benefit.

[A] Reduce data redundancy [B] Improve data integrity

[C] Reduce development time [D] All of the above

14.5 Limitations of A Database :

A Database structure is more complex than a File structure. To develop larger database, training has to be provided to the database designer. Database application also needs more storage space, memory and processing power than files. To manage, or maintain database trained database administrator is required. Protection of the database and periodic backup of the database is art and can be done by skilled persons only.

14.6 Types of A Databases :

Different databases and DBMSs are using specific data model. A data model consists of standards and rules that defines how the database organize the data. A data model is used to define how different users view the organization of data. Depends on which data model is used in the database, databases can be classified into two types.

1. **Relational Database :** A relational database is a database that stores data in tables that has columns and rows. The tables are related to each other by defining relations between tables. A Relation provides link between data stored in the separate tables. Examples of relation databases are Payroll system, Inventory system, Invoicing, Library management system etc.
2. **Object–Oriented Database :** An object–oriented database stores the data in the form of various objects. Each object has its own data and specific methods defined into its structure called class. Examples of object–oriented database are media database which stores pictures, videos, audios etc. with their attributes, groupware database which stores manuals, calendar, memos, reports, schedules etc.

❑ Check Your Progress – 4 :

1. Inventory is an example of _____ database.

[A] Relational [B] object–oriented

[C] Multidimensional [D] None of the above

2. Example of object–oriented database is _____.

[A] Inventory system [B] Invoicing system

[C] Groupware system [D] Payroll system

3. In _____ database, objects are stored which has data and methods.

[A] Relational [B] object–oriented

[C] Multidimensional [D] None of the above

14.7 Let Us Sum Up :

In this unit :

- We have discussed about database system.
- We have learnt hierarchy of data in the database.
- We gain awareness of DBMS software.
- We have seen, advantages and disadvantages of database.
- We have understood different types of databases.

14.8 Suggested Answers For Check Your Progress :

❑ **Check Your Progress 1 :**

1. [A] 2. [B] 3. [D]

❑ **Check Your Progress 2 :**

1. [D] 2. [B] 3. [C]

❑ **Check Your Progress 3 :**

1. [C] 2. [D] 3. [A]

❑ **Check Your Progress 4 :**

1. [B] 2. [C] 3. [A]

❑ **Check Your Progress 5 :**

1. [C] 2. [B] 3. [D]

14.9 Glossary :

DBMS : Database Management System. It is a software used to create and manage databases.

SQL : Structured Query Language. It is 4th GL Language used to operate the databases.

14.10 Assignment :

1. List and explain advantages and disadvantages of Database.
2. What is Database ? What is DBMS ? Explain both in brief.
3. List and explain types of DBMS.

14.11 Activity :

Make a list of different types DBMS system. Mention merits and demerits of each DBMS system.

14.12 Case Study :

Find "Normalization of DBMS" on the internet and write different types of it.

14.13 Further Reading :

1. Computer Fundamentals by P.K.Sinha and Priti Sinha.
2. Discovering Computers 2016 by Shelly Cashman Series. CENGAGE publications.
3. Computer Fundamentals by Pearl Software, Khanna Book Publishing.

BLOCK SUMMARY :

- Set of instructions written in a specific language is called program and set of programs is called software.
- Software can be further classified as System software and Application software.
- That software which are dealing with the hardware devices directly is called system software. Operating systems and Utility programs are example of system software.
- Software which do not deal with the hardware devices directly is called Application software. Word processor, Excel spread sheets, presentation software, graphics software are examples of application software.
- To store huge amount of data in organized way, we need to use database applications rather than files.
- A Software which allows us to create and manage databases are called DBMS (Database Management System).
- SQL (Structured Query Language) is used to operate database; it is a 4th Generation Language.

BLOCK ASSIGNMENT :

❖ **Short Answer Questions :**

(1) List the functions of an operating system

(2) List all network operating systems

(3) List all features of network OS

(4) What is Application software ? List any 4 application software you know

(5) What is validation ? List all types of data validation in DBMS

(6) List all advantages of DBMS

❖ **Long Questions :**

(1) What is operating system ? Explain in brief

(2) Explain utility programs in brief

(3) Explain data hierarchy in brief

(4) List and explain different types of databases.

❖ **Enrolment No. :** ____

1. How many hours did you need for studying the units ?

Unit No.	12	13	14
No. of Hrs.			

2. Please give your reactions to the following items based on your reading of the block :

Items	Excellent	Very Good	Good	Poor	Give specific example if any
Presentation Quality	☐	☐	☐	☐	_____
Language and Style	☐	☐	☐	☐	_____
Illustration used (Diagram, tables etc)	☐	☐	☐	☐	_____
Conceptual Clarity	☐	☐	☐	☐	_____
Check your progress Quest	☐	☐	☐	☐	_____
Feed back to CYP Question	☐	☐	☐	☐	_____

3. Any other Comments

.....

.....

.....

.....

.....

.....

.....

.....