Database Management Systems Tutorials

Chapter 1 Introduction to Database Systems

Questions (with Answers provided)

1. What is a database?
2. What are the main features of a database?
3. What is a DBMS?
4. What are the advantages of using the DBMS approach?
5. What are the major concerns of using the DBMS approach?
6. What are the main components of a DBMS?
7. Would a DBMS designed for use on a PC by a single user also have the same components?
8. What are the responsibilities of a DBA?
9. Describe the three-level conceptual structure of a database system
10. What is data independence? What is data abstraction? Why are they important?

Answers

1. What is a database?

A database may be defined as a well organized collection of data that are related in a meaningful way which can be accessed in different logical orders but are stored only once.

The data in the database is therefore integrated, structured, and shared.

2. What are the main features of a database?

The main features of data in a database are:

(a) It is well organized
(b) It is related
(c) It is accessible in different orders without great difficulty
(d) It is stored only once

3. What is a DBMS?

To be able to carry out operations like insertion, deletion and retrieval, the database needs to be managed by a substantial package of software. This software is usually called a Database Management System (DBMS).

A Database Management System (DBMS) may be defined as a software package that controls the specification, organization, storage, retrieval and update of data in a database.

A DBMS relieves the user from having to know about exact physical representations of data and having to specify detailed algorithms for storing, updating and retrieving data.

4. What are the advantages of using the DBMS approach?

There are a number of advantages of using a DBMS approach for data storage and retrieval as compared to conventional file processing. Some of these are listed below.

(a) Redundancies and inconsistencies can be reduced

(b) Better service to the Users

(c) Flexibility of the system is improved

(d) Cost of developing and maintaining systems is lower

(e) Standards can be enforced

(f) Security can be improved

(g) Integrity can be improved

(h) Enterprise requirements can be identified

(i) Data model must be developed

5. What are the major concerns of using the DBMS approach?

A database system generally provides on-line access to the database for many users. Because of the larger number of users accessing the data when a database is used, the enterprise may involve additional risks as compared to a conventional data processing system in the following areas.

(a) Confidentiality, Privacy and Security

(b) Data Quality

(c) Data Integrity

(d) Enterprise Vulnerability

6. What are the main components of a DBMS?

A database management system is a complex piece of software that usually consists of a number of modules. To enable the DBMS to fulfill its tasks, the DBMS must maintain information about the data itself that is stored in the system. This information would normally include what data is stored, how it is stored, who has access to what parts of it and so on.

The database system must provide a query language and an embedded host language to meet the needs of the users.

In addition, a DBMS includes facilities for the following:

- describing the database, when a database is being set up
- authorization specification and checking
- access path selection
- concurrency control
- logging and recovery

7. Would a DBMS designed for use on a PC by a single user also have the same components?

A DBMS for a PC need not include all the components of DBMS that are required for an enterprise DBMS. PC systems generally do not need facilities like concurrency control and logging and recovery.

8. What are the responsibilities of a DBA?

Usually a person (or a group of persons) centrally located, with an overall view of the database, is needed to keep the database running smoothly. Such a person is called the Database Administrator (DBA).

The DBA normally has a large number of tasks related to maintaining and managing the database. These tasks include the following:

(a) Deciding and Loading the Database Contents

(b) Assisting and Approving Applications and Access

(c) Deciding Data Structures

(d) Backup and Recovery

(e) Monitor Actual Usage

9. Describe the three-level conceptual structure of a database system

The three-level architecture was suggested by ANSI/SPARC in 1972. Under this approach, a database is considered as containing data about an *enterprise*. The three–level architecture provides three different views of the data. We now discuss these views in some detail.

The top view is called the *external view*. Each individual user has his/her own view of his/her enterprise database. This view may be a restricted view of the database and the same database is likely to provide a number of different views for different classes of users.

The next level is called the *conceptual view*. This view is the information model of the enterprise and contains the view of the whole enterprise without any concern for its physical implementation.

The last view is the *internal view.* This is the physical or storage view of the database which mostly does not need to be understood by the users. The person managing the database needs to understand this view since the efficiency of the database depends on how it is stored.

10. What is data independence? What is data abstraction? Why are they important?

A database system that is able to separate the three different views of data is likely to be flexible and adaptable. This flexibility and adaptability is called *data abstraction.*

Data independence deals with independence between the way the data is structured and the programs that manipulate it. That is, application programs in a database system can continue to work independent of the storage structure of the database. Given data independence, a DBMS may change the structure of the data without having to change the application programs.

Additional Questions (Answers not provided)

1. Explain in brief the history of evolution of database software.
2. List five web sites that maintain very large database systems.
3. What is data governance? Why is it important for large enterprises?
4. List all types of users that often use a database system
5. Present an example of DBMS system architecture.
6. Explain the motivation behind the development of database technology.
7. Why is information of such importance for modern enterprises?
8. Select an enterprise that you are familiar with (for example, a school, a college, a company, a small business, a club or association). List all the information that this enterprise uses.
9. Present a conceptual view of a student database. Present some external views that different types of end users might have and show the mappings of these views to the conceptual view.
10. List the issues that you would consider when selecting a commercial DBMS for an enterprise.