

Chapter 3. Database

1. What do you understand about 'Database'?

Database is an organized collection of related data where the data is stored and organized to serve some specific purpose.

2. Define DBMS.

DBMS stands for Database Management System. It is a collection of application programs which allow the user to organize, restore and retrieve information about data efficiently and as effectively as possible.

Some of the popular DBMS's are MySql, Oracle, Sybase, etc.

3. Enlist the advantages of DBMS.

- Data is stored in a structured way and hence redundancy is controlled.
- Validates the data entered and provides restrictions on unauthorized access to the database.
- Provides backup and recovery of the data when required.
- It provides multiple user interfaces.

4. What do you understand about Data Redundancy?

Duplication of data in the database is known as data redundancy. As a result of data redundancy, duplicated data is present at multiple locations, hence it leads to wastage of the storage space and the integrity of the database is destroyed.

5. What are the various types of relationships in Database? Define them.

- **One-to-one:** One table has a relationship with another table having a similar kind of column. Each primary key relates to only one or no record in the related table.
- **One-to-many:** One table has a relationship with another table that has primary and foreign key relations. The primary key table contains only one record that relates to none, one or many records in the related table.
- **Many-to-many:** Each record in both the tables can relate to many numbers of records in another table.

6. Explain Normalization and De-Normalization.

Normalization is the process of removing redundant data from the database by splitting the table in a well-defined manner in order to maintain data integrity. This process saves much of the storage space.

De-normalization is the process of adding up redundant data on the table in order to speed up the complex queries and thus achieve better performance.

7. What are the different types of Normalization?

- **First Normal Form (1NF)**: A relation is said to be in 1NF only when all the entities of the table contain unique or atomic values.
- **Second Normal Form (2NF)**: A relation is said to be in 2NF only if it is in 1NF and all the non-key attributes of the table are fully dependent on the primary key.
- **Third Normal Form (3NF)**: A relation is said to be in 3NF only if it is in 2NF and every non-key attribute of the table is not transitively dependent on the primary key.

8. What is SQL?

Structured Query language, SQL is an ANSI(American National Standard Institute) standard programming language that is designed specifically for storing and managing the data in the relational database management system (RDBMS) using all kinds of data operations.

9. How many SQL statements are used? Define them.

SQL statements are basically divided into three categories, DDL, DML, and DCL.

- **Data Definition Language (DDL)** commands are used to define the structure that holds the data. These commands are auto-committed i.e. changes done by the DDL commands on the database are saved permanently.
- **Data Manipulation Language (DML)** commands are used to manipulate the data of the database. These commands are not auto-committed and can be rolled back.
- **Data Control Language (DCL)** commands are used to control the visibility of the data in the database like revoke access permission for using data in the database.

10. Enlist the advantages of SQL.

- Simple SQL queries can be used to retrieve a large amount of data from the database very quickly and efficiently.
- SQL is easy to learn and almost every DBMS supports SQL.
- It is easier to manage the database using SQL as no large amount of coding is required.

11. Enlist some commands of DDL, DML, and DCL.

Data Definition Language (DDL) commands:

- CREATE to create a new table or database.
- ALTER for alteration.
- TRUNCATE to delete data from the table.
- DROP to drop a table.
- RENAME to rename a table.

Data Manipulation Language (DML) commands:

- INSERT to insert a new row.
- UPDATE to update an existing row.
- DELETE to delete a row.
- MERGE for merging two rows or two tables.

Data Control Language (DCL) commands:

- COMMIT to permanently save.
- ROLLBACK to undo the change.
- SAVEPOINT to save temporarily.

12. Explain the terms ‘Record’, ‘Field’ and ‘Table’ in terms of database.

Record: Record is a collection of values or fields of a specific entity. **For Example**, An employee, Salary account, etc.

Field: A field refers to an area within a record that is reserved for specific data. **For Example**, Employee ID.

Table: Table is the collection of records of specific types. **For Example**, the Employee table is a collection of records related to all the employees.

13. What are the advantages and disadvantages of views in the database?

View is a virtual table that does not have its data on its own rather the data is defined from one or more underlying base tables.

Advantages of Views:

- As there is no physical location where the data in the view is stored, it generates output without wasting resources.
- Data access is restricted as it does not allow commands like insertion, updation, and deletion.

Disadvantages of Views:

- The view becomes irrelevant if we drop a table related to that view.
- Much memory space is occupied when the view is created for large tables.

14. What do you understand about Functional dependency?

A relation is said to be in functional dependency when one attribute uniquely defines another attribute.

For Example, R is a Relation, X and Y are two attributes. T1 and T2 are two tuples. Then,

T1[X]=T2[X] and T1[Y]=T2[Y]

Means, the value of component X uniquely defines the value of component Y.

Also, X->Y means Y is functionally dependent on X.

15. When is functional dependency said to be fully functional dependent?

To fulfill the criteria of fully functional dependency, the relation must meet the requirement of functional dependency.

A functional dependency 'A' and 'B' are said to be fully functional dependent when removal of any attribute say 'X' from 'A' means the dependency does not hold anymore.

16. What do you understand by the E-R model?

E-R model is an Entity-Relationship model which defines the conceptual view of the database.

The E-R model basically shows the real-world entities and their association/relations. Entities here represent the set of attributes in the database.

17. Define Entity, Entity type, and Entity set.

Entity can be anything, be it a place, class or object which has an independent existence in the real world.

Entity Type represents a set of entities that have similar attributes.

Entity Set in the database represents a collection of entities having a particular entity type.

18. Define a Weak Entity set.

Weak Entity set is the one whose primary key comprises its partial key as well as the primary key of its parent entity. This is the case because the entity set may not have sufficient attributes to form a primary key.

19. Explain the terms 'Attribute' and 'Relations'

Attribute is described as the properties or characteristics of an entity. **For Example**, Employee ID, Employee Name, Age, etc., can be attributes of the entity Employee.

Relation is a two-dimensional table containing a number of rows and columns where every row represents a record of the relation. Here, rows are also known as 'Tuples' and columns are known as 'Attributes'.

20. What is the Database transaction?

Sequence of operation performed which changes the consistent state of the database to another is known as the database transaction. After the completion of the transaction, either the successful completion is reflected in the system or the transaction fails and no change is reflected.

21. What do you understand by Join?

Join is the process of deriving the relationship between different tables by combining columns from one or more tables having common values in each. When a table joins with itself, it is known as Self Join.

22. What are the disadvantages of a Query?

- Indexes are not present.
- Stored procedures are excessively compiled.
- Difficulty in interfacing.

23. Define Join types.

Answer: Given below are the types of Join, which are explained with respect to the tables as an Example.

employee table:



EmplID	EmpName
1000	Rohan
1001	Shruti
1002	Nikhil
1003	Naveen

employee_info table:



EmplID	Address
1000	Delhi
1001	Mumbai
1002	Delhi
1003	Kolkata

a) Inner JOIN: Inner JOIN is also known as a simple JOIN. This SQL query returns results from both the tables having a common value in rows.

SQL Query:

```
SELECT * from employee, employee_info WHERE employee.EmpID = employee_info.EmpID ;
```

Result:



EmpID	EmpName	EmpID	Address
1000	Rohan	1000	Delhi
1001	Shruti	1000	Delhi
1002	Nikhil	1000	Delhi
1003	Naveen	1000	Delhi
1000	Rohan	1001	Mumbai
1001	Shruti	1001	Mumbai
1002	Nikhil	1001	Mumbai
1003	Naveen	1001	Mumbai
1000	Rohan	1002	Delhi
1001	Shruti	1002	Delhi
1002	Nikhil	1002	Delhi
1003	Naveen	1002	Delhi
1000	Rohan	1003	Kolkata
1001	Shruti	1003	Kolkata
1002	Nikhil	1003	Kolkata
1003	Naveen	1003	Kolkata

b) Natural JOIN: This is a type of Inner JOIN that returns results from both the tables having the same data values in the columns of both the tables to be joined.

SQL Query:

```
SELECT * from employee NATURAL JOIN employee_info;
```

Result:



EmpID	EmpName	Address
1000	Rohan	Delhi
1001	Shruti	Mumbai
1002	Nikhil	Delhi
1003	Naveen	Kolkata

c) Cross JOIN: Cross JOIN returns the result as all the records where each row from the first table is combined with each row of the second table.

SQL Query:

```
SELECT * from employee CROSS JOIN employee_info;
```

Result:

Let us do some modification in the above tables to understand Right JOIN, Left JOIN, and Full JOIN.

employee table:



EmpID	EmpName
1000	Rohan
1001	Shruti
1002	Nikhil
1003	Naveen
1004	Shikha
1005	Shalu

employee_info table:



EmpID	Address
1000	Delhi
1001	Mumbai
1002	Gurgaon
1003	Kolkata
1006	Noida
1007	Kerala

a) Right JOIN: Right JOIN is also known as Right Outer JOIN. This returns all the rows as a result from the right table even if the JOIN condition does not match any records in the left table.

SQL Query:

```
SELECT * from employee RIGHT OUTER JOIN employee_info on (employee.EmpID = employee_info.EmpID);
```

Result:



EmpID	EmpName	EmpID	Address
1000	Rohan	1000	Delhi
1001	Shruti	1001	Mumbai
1002	Nikhil	1002	Delhi
1003	Naveen	1003	Kolkata
Null	Null	1006	Noida
Null	Null	1007	Kerala

b) Left JOIN: Left JOIN is also known as Left Outer JOIN. This returns all the rows as a result of the left table even if the JOIN condition does not match any records in the right table. This is exactly the opposite of Right JOIN.

SQL Query:

```
SELECT * from employee LEFT OUTER JOIN employee_info on (employee.EmpID = employee_info.EmpID);
```

Result:



EmpID	EmpName	EmpID	Address
1000	Rohan	1000	Delhi
1001	Shruti	1001	Mumbai
1002	Nikhil	1002	Delhi
1003	Naveen	1003	Kolkata
1004	Shikha	null	Null
1005	Shalu	null	Null

c) Outer/Full JOIN: Full JOIN return results in combining the result of both the Left JOIN and Right JOIN.

SQL Query:

```
SELECT * from employee FULL OUTER JOIN employee_info on (employee.EmpID = employee_info.EmpID);
```

Result:

EmplD	EmpName	EmplD	Address
1000	Rohan	1000	Delhi
1001	Shruti	1001	Mumbai
1002	Nikhil	1002	Delhi
1003	Naveen	1003	Kolkata
1004	Shikha	null	Null
1005	Shalu	null	Null
Null	Null	1006	Noida
Null	Null	1007	Kerala

24. Explain the Data Dictionary.

Data dictionary is a set of information describing the content and structure of the tables and database objects. The job of the information stored in the data dictionary is to control, manipulate and access the relationship between database elements.

25. Explain the Primary Key and Composite Key.

Primary Key is that column of the table whose every row data is uniquely identified. Every row in the table must have a primary key and no two rows can have the same primary key. Primary key value can never be null nor can it be modified or updated.

Composite Key is a form of the candidate key where a set of columns will uniquely identify every row in the table.

26. What do you understand about the Unique key?

A Unique key is the same as the primary key whose every row data is uniquely identified with a difference of null value i.e. Unique key allows one value as a NULL value.

27. Name the different data models that are available for database systems.

Different data models are:

- Relational model

- Network model
- Hierarchical model

28. Differentiate between ‘DELETE’, ‘TRUNCATE’ and ‘DROP’ commands.

After the execution of ‘**DELETE**’ operation, COMMIT and ROLLBACK statements can be performed to retrieve the lost data.

After the execution of ‘**TRUNCATE**’ operation, COMMIT, and ROLLBACK statements cannot be performed to retrieve the lost data.

‘**DROP**’ command is used to drop the table or key like the primary key/foreign key