| **Stored Procedure (SP)** | **Function (UDF - User Defined)** |
| --- | --- |
| SP can return zero, single or multiple values. | Function must return a single value (which may be a scalar or a table). |
| We can use transaction in SP. | We can't use transaction in UDF. |
| SP can have input/output parameter. | Only input parameter. |
| We can call function from SP. | We can't call SP from function. |
| We can't use SP in SELECT/ WHERE/ HAVING statement. | We can use UDF in SELECT/ WHERE/ HAVING statement. |
| We can use exception handling using Try-Catch block in SP. | We can't use Try-Catch block in UDF. |

## Microsoft SQL Server, which is the entire database architecture and not a language.

**Usage of SQL Server**

**To maintain databases**. To analyze the data through SQL Server Analysis Services (SSAS). To generate reports through SQL Server Reporting Services (SSRS). To carry out ETL operations through SQL Server Integration Services (SSIS).

**Advantages:**

Enterprise-Grade Management Software

Excellent Data Recovery Support

**Why SQL Server is better than other databases?**

However, SQL server is more secure than MySQL. **It does not let any process to access and manipulate the database files at run time**. Users need to perform specific functions or manipulate files by executing an instance. This prevents hackers to access or manipulate the data directly

What is Transact-SQL used for?

T-SQL or Transact SQL is the query language specific to the Microsoft SQL Server product. It can help perform operations like **retrieving the data from a single row, inserting new rows, and retrieving multiple rows**. It is a procedural language that is used by the SQL Server.

## 1. How to create a database in SQL Server?

A database is an organized file of data. It is a collection of schemas, tables, procedures, code functions, and other objects. Various query languages are used to access and manipulate data. In SQL Server, a table is an object that stores data in a tabular (columns and rows) form.

You can create a new database using the CREATE DATABASE SQL command.

**Syntax:**CREATE DATABASE DatabaseName

## 2. What is SQL?

Structured Query Language (SQL) is a programming language for accessing and manipulating Relational Database Management Systems (RDBMSs). SQL is widely used in popular RDBMSs such as SQL Server, Oracle, and MySQL. The smallest unit of execution in SQL is a query. A SQL query is used to select, update, and delete data.

In RDBMSs, all the data is stored in tables with each table consisting of rows and columns. The following is an example of a SQL query, CREATE DATABASE.

## 3. What is PL/SQL?

PL/SQL (Procedural Language for SQL) is a procedural language developed by Oracle to work with the Oracle database using procedures in SQL. PL/SQL program units are compiled by the Oracle Database server and stored inside the database. And at run-time, both PL/SQL and SQL run within the same server process, bringing optimal efficiency. PL/SQL automatically inherits the robustness, security, and portability of the Oracle Database. PL/SQL syntaxes include declarations for variables, constants, procedures, functions, conditions, and loops.

Control statements in PL/SQL:

* Control statements are very important in PL/SQL.
* Control Statements are elements in a program that controls the flow of program execution.
* The syntax of control statements is similar to regular English and is very similar to the choices that we make every day.
* Branching statements are as follows:
  + If statement
  + If - THEN - ELSE
  + Nested IF
  + Branching with logical connectivity
  + While
  + For Loop

Here is a more detailed article on PL/SQL: [PL/SQL Control Statements in Oracle](https://www.c-sharpcorner.com/UploadFile/a8024d/plsql-control-statements-in-oracle/).

## 4. What is the difference between SQL and PL/SQL?

SQL is the standard query language for adding, accessing, and manipulating data in RDBMSs. With SQL, you have:

* Only simple IF / Else statements.
* Through SQL you can interact with the database through ADO.NET
* In SQL you can execute a line of code
* It can run only on windows PL/SQL: It is referred to as Procedure Language/Structure Query Language:
* In PL/SQL you can execute a block of code not a single line of code.
* Deep control statements
* It can run in UNIX also.
* PL/SQL language includes object-oriented programming techniques such as encapsulation, function overloading, and information hiding (all but inheritance).

Click on the following link to read further: [SQL Vs PL / SQL](https://www.c-sharpcorner.com/Blogs/1422/sql-vs-pl-sql.aspx)

## 5. What is RDBMS?

RDBMS: It is referred to as Relation Database Management Systems (RDBMS). RDBMS possesses the below characteristics:

* Write-intensive operations: The RDBMS is frequently written to and is often used in transaction-oriented applications.
* Data in flux or historical data: The RDBMS is designed to handle frequently changing data. Alternatively, RDBMS can also store vast amounts of historical data, which can later be analyzed or "mined".
* Application-specific schema: The RDBMS is configured on a per-application basis and a unique schema exists to support each application.
* Complex data models. The relational nature of the RDBMS makes it suitable for handling sophisticated, complex data models that require many tables, foreign key values, complex join operations, and so on.
* Data integrity: The RDBMS features many components designed to ensure data integrity. This includes rollback operations, referential integrity, and transaction-oriented operations.

Click on the following link to read further: [Directory Services Vs RDBMS](https://www.c-sharpcorner.com/UploadFile/anandnarayanswamy/DSvsRDBMS08232005071026AM/DSvsRDBMS.aspx)

## 6. What is a database table?

Database table: The table contains records in the form of rows and columns. A permanent table is created in the database you specify and remains in the database permanently until you delete it. **Syntax:**

1. Create table TableName (ID INT, NAME VARCHAR(30) )
2. Drop syntax: drop table TableName
3. Select Syntax: Select \* from TableName

## 7. How do you create a table in SQL?

SQL provides an organized way for table creation:

**Syntax**

Create table TableName (columnName1 datatype, columnName2 datatype )

SQL

Copy

The following is an example of creating a simple table:

create table Info

(

Name varchar(20),

BirthDate date,

Phone nvarchar(12),

City varchar(20)

)

## 8. How to delete a table in SQL Server?

**Answer:** Delete the data record from the database table and delete an existing table with the following method:

**Syntax:** To delete all table records of a table:

Delete TableName

DELETE info

## 9. How to update a SQL Server database table using SQL?

To update an existing Table we use SQL Command UPDATE: It will update the records as per the user-defined query/need.

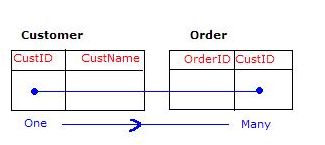
**Syntax**

Update TableName SET ColumnName = NewData where Condition

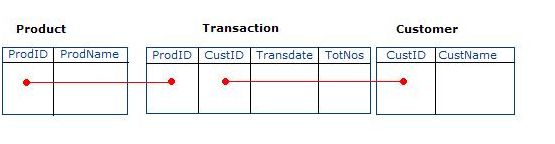
Update info Set City = 'Baroda' where id = 2

**One to Many & Many to One Relationship**

* For a One-to-Many relationship, a single column value in one table has one or more dependent column values in another table. Look at the following diagram:



**Many to Many Relationship** The third table acts as a bridge between the tables that want to establish a Many-to-Many relationship. The bridge table stores the common information between Many-to-Many relationship tables. Have a look at the following diagram:

****

## 11. What is the primary key of a database?

A table column with this constraint is called the key column for the table. This constraint helps the table to make sure that the value is not repeated and also that there are no null entries.

Now, this column does not allow null values and duplicate values. You can try inserting values to violate these conditions and see what happens. A table can have only one Primary key. Multiple columns can participate in the primary key.

## 12. What is a foreign key of a database?

**Answer:** To define the relationship between two tables (one is called the parent and the other one is the child table) connected by columns, a foreign key constraint is used. In this constraint, the values of the child table must appear in the parent table, which means that for a foreign key, one table should point to a Primary Key in another table. A table can have multiple foreign keys and each foreign key can have a different referenced table.

**Example:** To understand the foreign key clearly, let's assume the following two tables:

CUSTOMER {Cust\_ID, Cust\_Name, Age, ContactNo, Gender, Address}

VENDOR {Vend\_ID, Vend\_Name, Cust\_ID}

**Example:**

Foreign Key Constraint while using the CREATE TABLE statement.

**Syntax**

CREATE TABLE table\_name

(

Col1 datatype NOT NULL,

Col2 datatype NOT NULL,

Col3 datatype NOT NULL,

CONSTRAINT FK\_Column FOREIGN KEY(Col1, Col2, Col3) REFERENCES parent\_table(Col1, Col2, Col3)

);

**1. What are the two authentication modes in SQL Server?**

There are two authentication modes –

* Windows Mode
* Mixed Mode

Windows Authentication mode enables Windows Authentication and disables SQL Server Authentication.

Mixed mode enables both Windows Authentication and SQL Server Authentication.

Windows Authentication is always available and cannot be disabled.

Modes can be changed by selecting the tools menu of SQL Server configuration properties and choose security page.

**2. What Is SQL Profiler?**

SQL Profiler is a tool which allows system administrator to monitor events in the SQL server. This is mainly used to capture and save data about each event of a file or a table for analysis.

**3. What is recursive stored procedure?**

SQL Server supports recursive stored procedure which calls by itself. Recursive stored procedure can be defined as a method of problem solving wherein the solution is arrived repetitively. It can nest up to 32 levels.

**4. What are the differences between local and global temporary tables?**

* Local temporary tables are visible when there is a connection, and are deleted when the connection is closed.

CREATE TABLE #<tablename>

* Global temporary tables are visible to all users, and are deleted when the connection that created it is closed.

CREATE TABLE ##<tablename>

**5. What is CHECK constraint?**

A CHECK constraint can be applied to a column in a table to limit the values that can be placed in a column. Check constraint is to enforce integrity.

**6. Can SQL servers linked to other servers?**

SQL server can be connected to any database which has OLE-DB provider to give a link. Example: Oracle has OLE-DB provider which has link to connect with the SQL server group.

**7. What is sub query and its properties?**

A sub-query is a query which can be nested inside a main query like Select, Update, Insert or Delete statements. This can be used when expression is allowed. Properties of sub query can be defined as

* A sub query should not have order by clause
* A sub query should be placed in the right hand side of the comparison operator of the main query
* A sub query should be enclosed in parenthesis because it needs to be executed first before the main query
* More than one sub query can be included

**Why is SQL Server Agent needed?**

Benefits of SQL Server Agent  
  
SQL Server Agent uses SQL Server **to store job information**. Jobs contain one or more job steps. Each step contains its own task, for example, backing up a database. SQL Server Agent can run a job on a schedule, in response to a specific event, or on demand.

**8. What are the types of sub query?**

There are three types of sub query –

* Single row sub query which returns only one row
* Multiple row sub query which returns multiple rows
* Multiple column sub query which returns multiple columns to the main query. With that sub query result, Main query will be executed.

**9. What is SQL server agent?**

The SQL Server agent plays a vital role in day to day tasks of SQL server administrator(DBA). Server agent’s purpose is to implement the tasks easily with the scheduler engine which allows our jobs to run at scheduled date and time.

**10. What are scheduled tasks in SQL Server?**

Scheduled tasks or jobs are used to automate processes that can be run on a scheduled time at a regular interval. This scheduling of tasks helps to reduce human intervention during night time and feed can be done at a particular time. User can also order the tasks in which it has to be generated.

**11. What is COALESCE in SQL Server?**

COALESCE is used to return first non-null expression within the arguments. This function is used to return a non-null from more than one column in the arguments.

Example –

Select COALESCE(empno, empname, salary) from employee;

**12. How exceptions can be handled in SQL Server Programming?**

Exceptions are handled using TRY—-CATCH constructs and it is handles by writing scripts inside the TRY block and error handling in the CATCH block.

**13. What is the purpose of FLOOR function?**

FLOOR function is used to round up a non-integer value to the previous least integer. Example is given

FLOOR(6.7)

Returns 6.

**14. Can we check locks in database? If so, how can we do this lock check?**

Yes, we can check locks in the database. It can be achieved by using in-built stored procedure called sp\_lock.

**15. What is the use of SIGN function?**

SIGN function is used to determine whether the number specified is Positive, Negative and Zero. This will return +1,-1 or 0.

Example –

SIGN(-35) returns -1

**16. What is a Trigger?**

Triggers are used to execute a batch of SQL code when insert or update or delete commands are executed against a table. Triggers are automatically triggered or executed when the data is modified. It can be executed automatically on insert, delete and update operations.

**17. What are the types of Triggers?**

There are four types of triggers and they are:

* Insert
* Delete
* Update
* Instead of

**18. What is an IDENTITY column in insert statements?**

IDENTITY column is used in table columns to make that column as Auto incremental number or a surrogate key.

**19. What is Bulkcopy in SQL?**

Bulkcopy is a tool used to copy large amount of data from Tables. This tool is used to load large amount of data in SQL Server.

**20. What will be query used to get the list of triggers in a database?**

Query to get the list of triggers in database-

Select \* from sys.objects where type='tr'

**21. What is the difference between UNION and UNION ALL?**

* UNION: To select related information from two tables UNION command is used. It is similar to JOIN command.
* UNION All: The UNION ALL command is equal to the UNION command, except that UNION ALL selects all values. It will not remove duplicate rows, instead it will retrieve all rows from all tables.

**22. How Global temporary tables are represented and its scope?**

Global temporary tables are represented with ## before the table name. Scope will be the outside the session whereas local temporary tables are inside the session. Session ID can be found using @@SPID.

**23. What are the differences between Stored Procedure and the dynamic SQL?**

Stored Procedure is a set of statements which is stored in a compiled form. Dynamic SQL is a set of statements that dynamically constructed at runtime and it will not be stored in a Database and it simply execute during run time.

**24.** **What is Collation?**

Collation is defined to specify the sort order in a table. There are three types of sort order –

1. Case sensitive
2. Case Insensitive
3. Binary

**25. How can we get count of the number of records in a table?**

Following are the queries can be used to get the count of records in a table –

Select \* from <tablename> Select count(\*) from <tablename> Select rows from sysindexes where id=OBJECT\_ID(tablename) and indid<2

**26. What is the command used to get the version of SQL Server?**

Select SERVERPROPERTY('productversion')

**27. What is UPDATE\_STATISTICS command?**

UPDATE\_STATISTICS command is used to update the indexes on the tables when there is a large amount of deletions or modifications or bulk copy occurred in indexes.

**28. What is the use of SET NOCOUNT ON/OFF statement?**

By default, NOCOUNT is set to OFF and it returns number of records got affected whenever the command is getting executed. If the user doesn’t want to display the number of records affected, it can be explicitly set to ON- (SET NOCOUNT ON).

**29. Which SQL server table is used to hold the stored procedure scripts?**

Sys.SQL\_Modules is a SQL Server table used to store the script of stored procedure. Name of the stored procedure is saved in the table called Sys.Procedures.

**30. What are Magic Tables in SQL Server?**

During DML operations like Insert, Delete, and Update, SQL Server creates magic tables to hold the values during the DML operations. These magic tables are used inside the triggers for data transaction.

**31. What is the difference between SUBSTR and CHARINDEX in the SQL Server?**

The SUBSTR function is used to return specific portion of string in a given string. But, CHARINDEX function gives character position in a given specified string.

SUBSTRING('Smiley',1,3)

Gives result as Smi

CHARINDEX('i', 'Smiley',1)

Gives 3 as result as I appears in 3rd position of the string

**32. How can you create a login?**

You can use the following command to create a login

CREATE LOGIN MyLogin WITH PASSWORD = '123';

**33. What is ISNULL() operator?**

ISNULL function is used to check whether value given is NULL or not NULL in sql server. This function also provides to replace a value with the NULL.

**34. What is the use of FOR Clause?**

FOR clause is mainly used for XML and browser options. This clause is mainly used to display the query results in XML format or in browser.

**35. What will be the maximum number of index per table?**

For SQL Server 2008 100 Index can be used as maximum number per table. 1 Clustered Index and 999 Non-clustered indexes per table can be used in SQL Server.

1000 Index can be used as maximum number per table. 1 Clustered Index and 999 Non-clustered indexes per table can be used in SQL Server.

1 Clustered Index and 999 Non-clustered indexes per table can be used in SQL Server.

**36. What is the difference between COMMIT and ROLLBACK?**

Every statement between BEGIN and COMMIT becomes persistent to database when the COMMIT is executed. Every statement between BEGIN and ROOLBACK are reverted to the state when the ROLLBACK was executed.

**37. What is the difference between varchar and nvarchar types?**

Varchar and nvarchar are same but the only difference is that nvarhcar can be used to store Unicode characters for multiple languages and it also takes more space when compared with varchar.

**38. What is the use of @@SPID?**

A @@SPID returns the session ID of the current user process.

**39. What is the command used to Recompile the stored procedure at run time?**

Stored Procedure can be executed with the help of keyword called RECOMPILE.

Example

Exe <SPName> WITH RECOMPILE

Or we can include WITHRECOMPILE in the stored procedure itself.

**40. How to delete duplicate rows in SQL Server?**

Duplicate rows can be deleted using CTE and ROW NUMER feature of SQL Server.

**41. Where are SQL Server user names and passwords stored in SQL Server?**

User Names and Passwords are stored in sys.server\_principals and sys.sql\_logins. But passwords are not stored in normal text.

**42. What is the difference between GETDATE and SYSDATETIME?**

Both are same but GETDATE can give time till milliseconds and SYSDATETIME can give precision till nanoseconds. SYSDATE TIME is more accurate than GETDATE.

**43. How data can be copied from one table to another table?**

INSERT INTO SELECT

This command is used to insert data into a table which is already created.

SELECT INTO

This command is used to create a new table and its structure and data can be copied from existing table.

**44. What is TABLESAMPLE?**

TABLESAMPLE is used to extract sample of rows randomly that are all necessary for the application. The sample rows taken are based on the percentage of rows.

**45. Which command is used for user defined error messages?**

RAISEERROR is the command used to generate and initiates error processing for a given session. Those user defined messages are stored in sys.messages table.

**46. What do mean by XML Datatype?**

XML data type is used to store XML documents in the SQL Server database. Columns and variables are created and store XML instances in the database.

**47. What is CDC?**

CDC is abbreviated as Change Data Capture which is used to capture the data that has been changed recently. This feature is present in SQL Server 2008.

**48. What is SQL injection?**

SQL injection is an attack by malicious users in which malicious code can be inserted into strings that can be passed to an instance of SQL server for parsing and execution. All statements have to checked for vulnerabilities as it executes all syntactically valid queries that it receives.

Even parameters can be manipulated by the skilled and experienced attackers.

**49. What are the methods used to protect against SQL injection attack?**

Following are the methods used to protect against SQL injection attack:

* Use Parameters for Stored Procedures
* Filtering input parameters
* Use Parameter collection with Dynamic SQL
* In like clause, user escape characters

**50. What is Filtered Index?**

Filtered Index is used to filter some portion of rows in a table to improve query performance, index maintenance and reduces index storage costs. When the index is created with WHERE clause, then it is called Filtered Index

**FEATURES IN SQL SERVER 2016**

* **Always Encrypted**

Enabling Always Encrypted Feature present under the Security Tab will make the SQL Server data always encrypted within the SQL Server. The encrypted data will be available only to the client application owners using the keys. These keys is never passed to the SQL Server, which means Database or System administrators cannot peek on the client sensitive data. The clients can peacefully store their confidential data in the cloud-managed database with the Always Encrypted Feature enabled free of unauthorized access.

* **Dynamic Data Masking**

This new feature in SQL Server 2016, is for those purposes where only some part of the SQL Server data needs to be hidden for security while some data remains visible to other users. Enabling Dynamic Data Masking feature in SQL Server limits sensitive data exposure by masking it to unauthorized users. It is also a part of preventing unauthorized access to sensitive data by allowing users to decide how much percentage of data should be revealed with less impact on application layer. This feature can be set up using the masking rules defined by the users. Example: while storing the credit card numbers or phone numbers, rules can be setup like first four digits should be visible and remaining digits should be hidden.

* **Support for JSON**

SQL Server 2016 has a new feature that provides support for JSON, Java Script Object Notation. This feature allows the JSON data to be exchanged between applications and SQL Server database engine. JSON is based on subset of JavaScript programming language and is a human readable that is also easy for computer to parse and generate. With this support, Microsoft allows SQL Server to parse JSON formatted data allowing it to store in a relation format. In addition to this, it also allows relational data to turn it into JSON formatted data. This feature has been aimed to make the applications easy to exchange JSON data with SQL Server.

* **Row Level Security**

This new feature in SQL Server 2016 provides Row level Security that allows SQL Server to restrict which users can view what data in a table based on a function. It has been helpful in case of multi-tenant environments where data access needs to be keep in limited access based on customer ID. Restriction of Rows can be done by filter predicates defined in inline table-value function and security rules will make the filter predicates execute for every SELECT or DELETE operation. Enabling the feature at database layer does not require application developers to maintain code for restricting data from some logins while allowing other logins to access all data. Though this feature has been already supported by other databases, SQL Server introduces it for the first time considering the need to provide security to row data.

* We can secure on a complete row
* **Temporal Table**

Temporal table is defined as a table holding old versions of rows within a base table. If the database is having temporal tables, SQL Server 2016 can automatically manage shifting old row versions to the temporal table whenever it is updated. Users who are planning to manage row versioning might find this modification quite helpful.

* It will keep track the current and historical data in database
* Data can be restored without down time
* It will provides ability to query the table snapshot at any point in time
* **Polybase :**
* We can query relational and non-relational data

Example : SQL + Big Data

**MSSQL IN SPRINGBOOT:**

## 1. Declare dependency for SQL Server JDBC Driver

<**dependency**>

    <**groupId**>com.microsoft.sqlserver</**groupId**>

    <**artifactId**>mssql-jdbc</**artifactId**>

    <**scope**>runtime</**scope**>

</**dependency**>

## 2. Specify Data Source Properties

spring.datasource.url=jdbc:sqlserver://sqlsrv\\sqlexpress;databaseName=customer

spring.datasource.username=username

spring.datasource.password=password

## 3.Connect to SQL Server with Spring Data JPA

|  |  |
| --- | --- |
| 1  2  3  4 | <**dependency**>      <**groupId**>org.springframework.boot</**groupId**>      <**artifactId**>spring-boot-starter-data-jpa</**artifactId**>  </**dependency**> |

spring.datasource.driver-class-name=com.microsoft.sqlserver.jdbc.SQLServerDriver

spring.jpa.hibernate.ddl-auto=update

spring.jpa.show-sql=true

spring.jpa.properties.hibernate.format\_sql=true

spring.jpa.properties.hibernate.dialect=org.hibernate.dialect. org.hibernate.dialect.SQLServer2008Dialect

#CREATES TABLE

spring.jpa.generate-ddl=true