ADITYA ENGINEERING COLLEGE (A)

DBMS
Basic SQL

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CONTENTS

SQL

IBM developed the original version of Sequel in 1970's. The Sequel language has evolved and its name has changed to SQL(Structured Query Language).

SQL has several parts

- **Data-definition language (DDL).** The SQL DDL provides commands for defining relation schemas, deleting relations, and modifying relation schemas.
- **Interactive data-manipulation language (DML).** The SQL DML includes a query language based on both the relational algebra and the tuple relational calculus. It includes also commands to insert tuples into, delete tuples from, and modify tuples in the database.
- **View definition**. The SQL DDL includes commands for defining views.
- **Transaction control**. SQL includes commands for specifying the beginning and ending of transactions.
- **Embedded SQL and dynamic SQL**. Embedded and dynamic SQL define how SQL statements can be embedded within general-purpose programming languages, such as C, C++, Java, PL/I, Cobol, Pascal, and Fortran.
- **Integrity.** The SQL DDL includes commands for specifying integrity constraints that the data stored in the database must satisfy. Updates that violate integrity constraints are disallowed.
- **Authorization.** The SQL DDL includes commands for specifying access rights to relations and views

SQL Data Types

- char(n):- A fixed-length character string with user specified length n. The word "**character**" can also be used
- varchar(n):- A variable-length character string with user specified maximum length n. The full form **character varying** is equivalent
- varchar2(n)
- integer/int :- An integer
- smallint: A small integer
- numeric(p,d):- number consists of p digits and d of the p digits are to the right of the decimal point. Eg: numeric(3,) allows 44.5 and not 444.5 or 4.45
- float(n): A floating point number with precision of atleast n digits
- Date:- A date. Format: YYYY-MM-DD. The supported range is from '1000-01-01' to '9999-12-31'

DDL and DML commands

DDL Commands

1) Create
2) Alter
3) Rename
4) Truncate
5) Drop

DML Commands

1) Insert
2) Select
3) Delete
4) Update

DCL and TCL commands

DCL Commands: DCL means Data Control Language. These DCL commands will control the Data access permission.

- GRANT – It permits users to access the database.
- REVOKE – This SQL DCL command withdraws the permission given by GRANT to access the database.

TCL Commands: TCL means Transaction Control Language. These TCL commands will control the Transactions

- COMMIT – This SQL TCL command will commit the running transaction
- ROLLBACK – Rollback the current transaction
- SAVEPOINT – You can set a save point so that, next time it will start from here
- SET TRANSACTION – Specify the characteristics of the transactions

Create Command

Create : It is used to create a table using schema.

Syntax:-

Create table tablename(A1 D1, A2 D2,…..AnDn,
Integrity constraint1,
.
.
Integrity constraintn)

A-Attribute in the schema of the relation

D-Domain type of values

Create Command

Ex:- students(sid:integer,name:string,age:integer)

```
Create table students
(
sid integer,                    //sid integer primary key
name varchar2(20),
age integer,
);
```

Insert Command

To insert data into a table

Syntax:

Insert into tablename values(value1,value2,…..valuen);

Insert into tablename(col2,col1,col3) values(value2,value1,value3);

Insert into tablename values(&value1,&value2,…..&valuen);

Ex:-

Insert into students values(501,'leela',22);

Insert into students(name,sid,age) values('suma',502,30);

Insert into students values(&sid,'&name',&age);

Enter sid: 503

Enter name: hema

Enter age: 23

Select Command

To retrieve rows selected from one or more tables.

Basic structure of SQL query consists of 3 clauses

1) Select:- It specifies the table columns that are retrieved.
2) From:- It lists the relations to be scanned.
3) Where:- It consists of predicate involving attributes of the relation.

To remove duplicates distinct can be used after select clause.

Ex:- Select name from students;

Select distinct name from students;

Select * from students;

Select Command

Syntax:-

Select [distinct] column1,column2 as newname from table1,table2

Where condition

Ex:-To retrieve all rows in students

Select * from students;

To display student id and name

Select sid,name as stuname from students;

To display distinct student id from students

Select distinct sid from students;

Alter Command

Alter command is used for altering the table structure, such as,

- to add a column to existing table
- to rename any existing column
- to change datatype of any column or to modify its size.
- to drop a column from the table.

Syntax:

ALTER TABLE table_name ADD(column_name1 datatype1
column_name2 datatype2);

ALTER TABLE table_name modify(column_name datatype);

ALTER TABLE table_name RENAME column old_column_name TO new_column_name;

ALTER TABLE table_name drop column column_name;

Rename and Drop Commands

Rename is used to change the name of a table.

Syntax:-

Rename <oldtablename> to <newtablename>

or

Alter table <tablename> Rename to <newtablename>

Drop is used to completely remove a table from the database. This will destroy the table structure and the data stored in it.

Syntax:-

Drop table tablename

Truncate, Delete and Update

TRUNCATE command removes all the records from a table. But this command will not destroy the table's structure.

Syntax:-

Truncate table tablename

The DELETE statement is used to delete existing records in a table.

Syntax:-

DELETE FROM <table_name> WHERE condition;

The Update statement is used to modify the existing records in a table.

Syntax:-

Update tablename set columname=value where condition;

Constraints

Constraints enforce limits to the data or type of data that can be inserted/updated/deleted from a table.

1) Not null
2) Unique
3) Check
4) Primary key
5) Foreign key
6) default

Not Null constraint

It indicates that a column cannot store null values.

Ex:-
```
create table student
(
rollno integer not null,
name varchar2(20),
marks integer
);
```

Column rollno in student table not to accept null values. If null values are given it shows cannot insert null into student.rollno

Select name from student where rollno is null;

Select name from student where rollno is not null;

Unique constraint

Ensures that each row for a column must have a unique value. It will eliminate duplication.

```
Create table student
(
Rollno integer,
Name varchar2(20),
Marks integer,
Unique(rollno));
```

Column rollno in student table must have unique values.

Check constraint

It ensures that the value in a column meets a specific condition. If you define a check constraint on a single column it allows only certain values for that column.

```
Create table student
(
Rno integer,
Name varchar2(20),
Marks integer,
Check(marks<100));
```

Marks column include integers less than 101.

Primary Key

A combination of not null and unique. It must contain unique values and cannot contain null values.

```
Create table student
(
Rno integer,
Name varchar2(20),
Marks integer,
Primary key(rno));
```

Foreign Key

It represent relationships between tables. A foreign key is a column whose values are derived from the primary key of other table.

Create table studentad

(

Rno integer,

Fee integer,

Foreign key(rno) references student(rno));

Foreign key “rno” in studentad table refers to primary key “rno” column in student table.

Primary and Foreign Key

Studentad (referrencing relation)

RNO	Fee
501	5000
502	6000
503	7000

Foreign key

Student (referrenced relation)

RNO	NAME	MARKS
501	Padma	50
502	Ravi	80
503	Rahul	70

Primary key

Default

At the time of column creation a default value can be assigned to it.

```
Create table students
(
Rno integer,
Name varchar2(20),
Gender char(1) default ‘F’,
Marks integer);
```

Default value for gender column is ‘F’

Domain Constraint

A domain is defined as the set of all values for an attribute.

Ex:- a domain of date is the set of all possible valid dates.

Database to prevent invalid dates being entered

30 february 2020

Data is rejected

Every attribute is bound to have a specific range of values

Ex:- age cannot be less than zero

Telephone numbers cannot contain a digit outside 0-9.

Domain constraints are tested easily by the system whenever a new data is entered into the database.

Operators

Arithmetic operators

Operators	Description
+	Add values on either side of the operator
-	Subtracts right hand operand from left hand operand
*	Multiplies values on either side of the operator
/	Divides left hand operand by right hand operand.
Mod(a,b)	Divides left hand operand by right hand operand and returns remainder.

Eg: SQL> select 30+20, 30-10, 30 *3, 30/2 FROM DUAL;
SQL> select sid,marks,marks+10,marks-10,marks*2,marks/10, mod(marks,10) from students;

Comparison Operators

Operators	Description
=	Examine both operands value that are equal or not,if yes condition become true.
!= or <>	This is used to check the value of both operands equal or not,if not equal, condition become true. (not equal to)
>	Examine the left operand value is greater than right Operand, if yes condition becomes true
<	Examines the left operand value is less than right Operand, if yes condition becomes true
>=	Examines that the value of left operand is greater than or equal to the value of right operand or not,if yes condition become true
<=	Examines that the value of left operand is less than or equal to the value of right operand or not, if yes condition becomes true

- Example:
- SQL> SELECT * FROM STUDENTS WHERE MARKS < 70;
- SQL> SELECT * FROM STUDENTS WHERE MARKS >= 70;
- SQL> SELECT * FROM STUDENTS WHERE MARKS > 90.25;
- SQL> SELECT * FROM STUDENTS WHERE MARKS <> 90.25;
- SQL> SELECT * FROM STUDENTS WHERE MARKS != 90.25;
- SQL> SELECT * FROM STUDENTS WHERE MARKS <= 90.25;
- SQL> SELECT * FROM STUDENTS WHERE MARKS = 90.25;

Logical Operators

Operators	Description
ALL	this is used to compare a value to all values in another value set. The ALL must be preceded by the comparison operators. Eg: >All(1,2) means greater than 2 and <All(2,3) means less than 2.
AND	this operator allows the existence of multiple conditions in an SQL statement's where clause.
ANY	this operator is used to compare a value to any applicable value in the list as per the condition. ANY must be preceded by comparison operators. Suppose using greater than (>) with ANY means greater than at least one value.
BETWEEN	this operator is used to search for values, that are within a set of values
IN	this operator is used to compare a value to that specified list value
OR	this operator is used to combine multiple conditions in SQL statement's where clause
EXISTS	The EXISTS checks the existence of a result of a Subquery. The subquery results true if the subquery returns some values. When the subquery returns true, the outer/main query is executed and otherwise no results would be displayed.
LIKE	this operator is used to compare a value to similar values using wildcard operator
IS NULL	The NULL operator is used to compare a value with a NULL value.
NOT	the NOT operator reverse the meaning of any logical operator. Eg: NOT EXISTS, NOT BETWEEN, NOT IN, etc. **This is a negate operator.**

1. SQL> select * from students where sid=2 and marks=67.45;
2. SQL> select * from students where sid=2 OR SID=3;
3. SQL> SELECT * FROM STUDENTS WHERE SID IN (2,5);
4. SQL> select * from students wheRE SNAME like 'c%';
5. SQL> select * from students wheRE SNAME not like 'c%';
6. SQL> select * from students wheRE Sid is not null;
7. SQL> select * from students wheRE Sid> any(1,2);
8. SQL> select * from students wheRE Sid>all(1,2);
9. SQL> select * from students wheRE Sid<all(3,5);
10. SQL> select * from students where exists (select sname from students where sid<3);
11. SQL> select * from students wheRE Sid between 2 and 4;

Operators

Aggregate operators

- AVG – calculates the average of a set of values.
- COUNT – counts rows in a specified table or view.
- MIN – gets the minimum value in a set of values.
- MAX – gets the maximum value in a set of values.
- SUM – calculates the sum of values.
- Example: SQL> SELECT COUNT(MARKS),AVG(MARKS),MIN(MARKS),MAX(MARKS),SUM(MARKS) FROM STUDENTS;

Set operators

Union It is used to combine the result-set of two or more SELECT statements.

Intersection It is used to combine two SELECT statements. The Intersect operation returns the common rows from both the SELECT statements.

Minus It combines the result of two SELECT statements. Minus operator is used to display the rows which are present in the first query but absent in the second query.

Date & Time functions

CURRENT_DATE	Return the current date
CURRENT_TIMESTAMP	Return the current date and time with time zone in the session time zone
EXTRACT	Extract a value of a date time field e.g., YEAR, MONTH, DAY, … from a date time value.
LAST_DAY	Gets the last day of the month of a specified date.
MONTHS_BETWEEN	Return the number of months between two dates.
SYSDATE	Return the current system date and time of the operating system where the Oracle Database resides.
SYSTIMESTAMP	Return the system date and time that includes fractional seconds and time zone.
TO_CHAR	Convert a DATE or an INTERVAL value to a character string in a specified format.
TO_DATE	Convert a date which is in the character string to a DATE value.
TRUNC	Return a date truncated to a specific unit of measure.

DATE & TIME FUNCTIONS

Example:

- SELECT CURRENT_DATE FROM dual;
- SELECT CURRENT_TIMESTAMP FROM dual;
- SELECT EXTRACT(YEAR FROM SYSDATE) FROM DUAL;
- select extract(year from date '2022-03-07') from dual;
- SELECT LAST_DAY(DATE '2016-02-01') FROM DUAL;
- SELECT MONTHS_BETWEEN(DATE '2017-07-01', DATE '2017-01-20') FROM DUAL;
- SELECT SYSDATE FROM DUAL;
- SELECT SYSTIMESTAMP FROM dual;
- SELECT TO_CHAR(DATE'2022-01-01', 'DL') FROM DUAL;
- SELECT TO_DATE('01 Jan 2017', 'DD MON YYYY') FROM DUAL;

Numeric functions

Functions	Description
ABS	Calculates the absolute value of an expression.
ACOS	Calculates the angle value (in radians) of a specified cosine.
ASIN	Calculates the angle value (in radians) of a specified sine.
ATAN	Calculates the angle value (in radians) of a specified tangent.
ATAN2	Returns a full-range (0 - 2 pi) numeric value indicating the arc tangent of a given ratio.
BITAND	Computes an AND operation on the bits of two integers.
CEIL	Returns the smallest whole number greater than or equal to a specified number.
COS	Calculates the cosine of an angle expression.
COSH	Calculates the hyperbolic cosine of an angle expression.
EXP	Returns e raised to the nth power, where e equals 2.71828183....
FLOOR	Returns the largest whole number equal to or less than a specified number.
LN	Returns the natural logarithm of an expression.

MOD	Returns the modulus of a number.
POWER	Returns m_value raised to the n_value power
REMAINDER	Returns the remainder after one numeric expression is divided by another.
ROUND	Returns the number rounded to the nearest multiple of a second number you specify or to the number of decimal places indicated by the second number.
SIGN	Returns a value that indicates if a specified number is less than, equal to, or greater than 0 (zero).
SIN	Calculates the sine of an angle expression. The result returned by SIN is a decimal value with the same dimensions as the specified expression.
SINH	Calculates the hyperbolic sine of an angle expression.
SQRT	Computes the square root of an expression.
TAN	Calculates the tangent of an angle expression.
TANH	Calculates the hyperbolic tangent of an angle expression.
TRUNC	Truncates a number to a specified number of decimal places.

Numeric functions

- SELECT ABS(-3.5) FROM DUAL;
- SELECT ceil(3.2) from dual;
- SELECT floor(3.2) from dual;
- SELECT exp(5) from dual;
- SELECT round(3.2) from dual;
- SELECT sqrt(4) from dual;
- SELECT ln(100) from dual;
- SELECT power(2,5) from dual;
- SELECT trunc(2.34567,2) from dual;
- SELECT remainder(5,2) from dual;

String functions

Function	Purpose
ASCII	Returns an ASCII code value of a character.
CHR	Converts a numeric value to its corresponding ASCII character.
CONCAT	Concatenate two strings and return the combined string.
CONVERT	Convert a character string from one character set to another.
DUMP	Return a string value (VARCHAR2) that includes the datatype code, length measured in bytes, and internal representation of a specified expression.
INITCAP	Converts the first character in each word in a specified string to uppercase and the rest to lowercase.
INSTR	Search for a substring and return the location of the substring in a string
LENGTH	Return the number of characters (or length) of a specified string
LOWER	Return a string with all characters converted to lowercase.
LPAD	Return a string that is left-padded with the specified characters to a certain length.
LTRIM	Remove spaces or other specified characters in a set from the left end of a string.
REGEXP_COUNT	Return the number of times a pattern occurs in a string.

REGEXP_INSTR	Return the position of a pattern in a string.
REGEXP_LIKE	Match a string based on a regular expression pattern.
REGEXP_REPLACE	Replace substring in a string by a new substring using a regular expression.
REGEXP_SUBSTR	Extract substrings from a string using a pattern of a regular expression.
REPLACE	Replace all occurrences of a substring by another substring in a string.
RPAD	Return a string that is right-padded with the specified characters to a certain length.
RTRIM	Remove all spaces or specified character in a set from the right end of a string.
SOUNDEX	Return a phonetic representation of a specified string.
SUBSTR	Extract a substring from a string.
TRIM	Remove the space character or other specified characters either from the start or end of a string.
UPPER	Convert all characters in a specified string to uppercase.

- SELECT ASCII('A') FROM DUAL;
- SQL> SELECT CHR('97') FROM DUAL;
- SELECT CONCAT('A','BC') FROM DUAL;
- SELECT INITCAP('hELLO hOW Are you') from dual;
- select instr('Where are you going','are') from dual;
- select length('how are you') from dual;
- select lower('How aRE yOu') from dual;
- select upper('How aRE yOu') from dual;
- select lpad('aaa',6,'*') from dual;
- select rpad('aaa',6,'*') from dual;
- select rtrim(‘aaa ') from dual;
- select replace('jack and jill','j','b') from dual;
- select substr('Where are you',2,7) from dual;

References

Text Books:

- Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH.
- Database System Concepts,5/e, Silberschatz, Korth, TMH.

Reference Books:

- Introduction to Database Systems, 8/e C J Date, PEA.
- Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA
- Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

Web Links:

- https://nptel.ac.in/courses/106/105/106105175/
- https://www.geeksforgeeks.org/introduction-to-nosql/
- https://beginnersbook.com/2015/05/normalization-in-dbms/


Thank
You