# 3. DQL (Data Query Language):

The Data Query Language is used to retrieve the data from a Table or a View from Relational Database Management Systems. The purpose of DQL Command is to get some schema relation based on the query passed to it. The **'Select'** keyword is used in DQL to access the data from a database object. It can be used in simple queries, views and stored procedures.

#### Syntax:

SELECT [ALL | DISTINCT ] column1,column2,.. [FROM table\_names] [WHERE spacific\_condition] [GROUP BY {col\_name | expr}] [ORDER BY {col\_name | expr} [ASC | DESC]]

We consider the following table of students, below is a selection from the "Students" table in the Aligarh database:

#### Example

To Retrieve/Fetch all the Fields/columns and all records/rows from the "Students" table: Use the following command:

#### mysql> SELECT \* FROM Students ;

Consider the Students table having the following records: -

_	Command Prompt -	mysql -u root			
Database	use aligarh; e changed				^
mysql> s	select * from st	tudents;			
Roll	Name	FatherName	DateOfAdmin	Gender	Technology
1	Asif Khan	Atif Khan	2019-11-20	Male	Software Engineering
2	Muhammad Ali	Hassan Ali	2018-12-23	Male	Information Technology
3	Asif Khan	Imran Khan	2017-03-17	Male	Information Technology
4	Farooq Ahmed	Umer Ahmed	2019-06-18	Male	Information Technology
4	Farooq Ahmed	Umer Ahmed	2019-06-18	Male	Information Technology
6	Samina Khan	Rashid Khan	2017-01-26	Female	Information Technology
7	Nadeem	Saleem	2019-05-29	Male	Software Engineering
8	Farooq Ahmed	Tanveer Ahmed	2016-04-22	Male	Software Engineering
9	Fozia Ali	Umer Ali	2019-05-21	Female	Software Engineering
10	Atif	Arif	2018-06-05	Male	Software Engineering
11	Imran	Rehan	2019-03-08	Male	Electronics
12	Nadia Khan	Jamal Khan	2018-04-08	Female	Electronics
++	+	+	+	+	++
12 rows	in set (0.00 se	ec)			
mysql>					×

#### Example

We specify the columns that we want to be displayed in the query result, selects the "Name" and "FatherName" columns from the "Students" table. Use the following command:

mysql> SELECT Name, FatherName FROM Students ;

Ca. Command Promp	ot - mysql -u root	
12 rows in set	(0.00 sec)	^
mysgl> SELECT Na	ame,FatherName F	ROM Students;
+	, +	+
Name	FatherName	
+	+	+
Asif Khan	Atif Khan	
Muhammad Ali	Hassan Ali	
Asif Khan	Imran Khan	
Farooq Ahmed	Umer Ahmed	
Farooq Ahmed	Umer Ahmed	
Samina Khan	Rashid Khan	
Nadeem	Saleem	
Faroog Ahmed	Tanveer Ahmed	
Fozia Ali	Umer Ali	
Atif	Arif	
Imran	Rehan	
Nadia Khan	Jamal Khan	
+	+	+
12 rows in set	(0.00 sec)	
mysql>		×

#### Example

The SELECT DISTINCT statement is used to return only distinct (different) values. Inside a table, a column often contains many duplicate values; and sometimes you only want to list the different (distinct) values. Use the following command:

0.5 12 rows in set (0.00 sec) mysql> SELECT DISTINCT Name,FatherNAme FROM Students ; Name FatherNAme Asif Khan Atif Khan Muhammad Ali | Asif Khan | Imran Khan Farooq Ahmed Samina Khan Umer Ahmed Rashid Khan Nadeem Saleem Farooq Ahmed Tanveer Ahmed Fozia Ali Umer Ali Atif Arif Imran Rehan Jamal Khan Nadia Khan l1 rows in set (0.04 sec) vsal>

mysql> SELECT DISTINCT Name, FatherName FROM Students;

~

### The SELECT command with WHERE Clause

The WHERE clause is used to filter records. The WHERE clause is used to extract only those records that fulfill a specified condition. The WHERE clause is not only used in SELECT statement, it is also used in UPDATE, DELETE statement, etc.! Use the following SQL statement selects all the Students from the Gender "Female", in the "Students" table:

Note: SQL requires single quotes around text values (most database systems will also allow double quotes). However, numeric fields should not be enclosed in quotes:

```
mysql> SELECT * FROM Students WHERE Gender='Female';
```

nysq1>us	dows\system32\cmd. se aligarh;	exe - mysql -u root				
	e changed ELECT * FROM	Students WH]	ERE Gender = 'l	Female';		
Roll	 Name	FatherName	DateOfAdmin	Gender	Technology	-
9		Umer Ali	2019-05-21	Female	Information Technolo   Software Engineering   Electronics	
B rows i	in set (0.001 s	:ec)		•		+
nysql>						
•		III				Þ

## The SQL AND, OR and NOT Operators

The WHERE clause can be combined with AND, OR, and NOT operators. The AND and OR operators are used to filter records based on more than one condition:

The AND operator displays a record if all the conditions separated by AND are TRUE.

The OR operator displays a record if any of the conditions separated by OR is TRUE.

The use following SQL statement selects all fields from "Students" where Gender is "Female" AND Technology is "Software Engineering":

mysql> SELECT \* FROM Students WHERE Gender='Female' and Technology="Software Engineering";

C:\Windows\system32\cmd.exe - mysql -u root								
nysq1>SELECT *	FROM Students	WHERE Gende	r='Female'	and Technology="Softw	are Engineering"			
Roll Name	FatherName	DateOfAdmin	Gender	Technology				
				Software Engineering				
row in set (0.	•		•		•			
nysql>								
•	III				F			

In Other example the following SQL statement selects all fields from "Students" where Gender is "Female" AND Technology must be "Software Engineering" OR "Information Technology" (use parenthesis to form complex expressions):

mysql> SELECT \* FROM Students WHERE Gender='Female' AND (Technology="Software Engineering"
OR Technology="Electronics");

C:\Wind	lows\system32\cm	d.exe - mysql -u root				
		ROM Students ="Electronics")		='Female'	and (Technology="Software	Engineering" 🔒
Roll	Name	FatherName	DateOfAdmin	Gender	Technology	
9 12	Fozia Ali Nadia Khan	Umer Ali RJamal Khan	2019-05-21 2018-04-08	Female Female	Software Engineering Electronics	
2 rows i	n set (0.059.	sec)		•	••	
mysql>						
						-
•		I	11			▶ 18

The Following is an example, which would fetch the all records from the Students table, where the Roll number is greater than 4 and the Roll number is less than 10 :-

mysql> SELECT \* FROM Students WHERE Roll > 4 AND Roll < 10;

C:\Windows\system32\cmd.ex	e - mysql -u root				
mysq1>SELECT * FROM	Students WHERI	E Roll > 4 ANI	) Roll < 1	.0;	<u>^</u>
Roll Name	FatherName	DateOfAdmin	Gender	Technology	
7   Nadeem     8   Faroog Ahmed	Saleem Tanveer Ahmed	2019-05-29 2016-04-22	Male Male	Information Technolo Software Engineering Software Engineering Software Engineering	
4 rows in set (0.040 se mysql)	c>				Ţ
•					► a

### The SQL ORDER BY Keyword

The ORDER BY keyword is used to sort the result-set in ascending or descending order. The ORDER BY keyword sorts the records in ascending order by default. To sort the records in descending order, use the DESC keyword.

The following SQL statement selects all Students records from the "Students" table, sorted by the "Name" column in ascending order:

mysql> SELECT \* FROM Students ORDER BY Name;

	dows\system32\cmd.e	2.1				
mysql> S		1 Students ORI				. ^
Roll	Name	FatherName	DateOfAdmin	Gender	Technology	
3 10 4 9 11 2 7 12	Asif Khan Asif Khan Atif Faroog Ahmed Faroog Ahmed Fozia Ali Ioran Muhammad Ali Naddeem Nadia Khan	Atif Khan Imran Khan Arif Umer Ahmed Ianveer Ahmed Umer Alined Umer Ali Rehan Hasan Ali Saleem KJamal Khan	2019-11-20 2017-03-17 2018-06-05 2019-06-18 2019-06-18 2019-06-18 2019-05-21 2019-05-21 2019-03-08 2019-05-23 2019-05-29 2018-12-23	Male Male Male Female Male Male Male Female	Software Engineering Information Technology Information Technology Information Technology Software Engineering Software Engineering Electronics Information Technology Software Engineering Electronics Information Technology	
12 rows	in set (0.001 s	sec)				
mysql>						-
•		111				►

Copy Right http://www.sirmasood.com In this example the following SQL statement selects all students from the "Students" table, sorted ascending by the "Name" and descending by the "FatherName" column:

Roll   Name	FatherName	DateOfAdmin	Gender	Technology	
1 : Asif Khan 10 : Atif 4 : Farooq Ahme 8 : Farooq Ahme 9 : Fozia Ali 11 : Imran 2 : Muhammad Al 7 : Nadeem 12 : Nadia Khan	Atif Khan   Arif d   Umer Ahmed d   Umer Ahmed d   Tanveer Ahmed   Umer Ali   Rehan i   Hasan Ali   Saleem   Jamal Khan	2019-11-20 2018-06-05 2019-06-18 2019-06-18 2019-06-18 2016-04-22 2019-05-21 2019-03-08 2019-03-08 2019-03-08 2018-12-23 2019-05-29 2018-04-08	Male   Male   Male   Male   Female   Male   Male   Female	Information Technology Software Engineering Software Engineering Information Technology Information Technology Software Engineering Electronics Information Technology Software Engineering Electronics Information Technology Information Technology	

mysql> SELECT \* FROM Students ORDER BY Name ASC, FatherName DESC;

### **SQL LIKE Operator**

The LIKE operator is used to list all rows in a table whose column values match a specified pattern. It is useful when you want to search rows to match a specific pattern, or when you do not know the entire value.

For this purpose, we use two wildcards often used in conjunction with the LIKE operator:

% - The percent sign represents zero, one, or multiple characters.

\_ - The underscore represent a single character.

mysql> SELECT \* FROM Students WHERE Name LIKE 'A%';

-		1.2	nd.exe - mysql -u ro					3
<u>n</u>	ysq1>se	elect * from		re name like 'f				*
	Ro 11	Name		DateOfAdmin	•	Technology		
	3	l Asif Khan	l Imran Khan	2017-03-17	Male	Software Engineering Information Technology Software Engineering		
3	rows :	in set (0.073	} sec)				*	
m	ysql>							
								Ŧ
•							F	

The above select statement searches for all the rows where the first letter of the column *Name* is 'A' and rest of the letters in the name can be any character.

The following SQL statement selects all Students with a Name that starts with "A" and are at least 4 characters in length:

mysql> SELECT \* FROM Students WHERE Name LIKE 'A\_\_\_%';

Here are some examples showing different LIKE operators with '%' and '\_' wildcards:

LIKE Operator	Description
WHERE Students Name LIKE 'a%'	Finds any values that start with "a"
WHERE Students Name LIKE '%a'	Finds any values that end with "a"
WHERE Students Name LIKE '%or%'	Finds any values that have "or" in any position
WHERE Students Name LIKE '_r%'	Finds any values that have "r" in the second position
WHERE Students Name LIKE 'a%'	Finds any values that start with "a" and are at least 3 characters in length
WHERE Students Name LIKE 'a%o'	Finds any values that start with "a" and ends with "o"

### **SQL GROUP Functions**

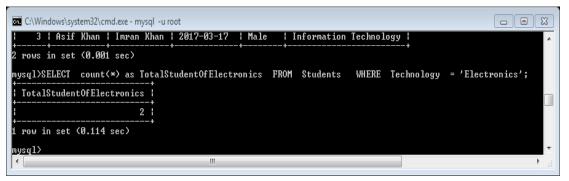
Group functions are built-in SQL functions that operate on groups of rows and return one value for the entire group. These functions are COUNT, MAX, MIN, AVG and SUM etc.

## SQL COUNT ():

This function returns the number of rows in the table that satisfies the condition specified in the WHERE condition. If the WHERE condition is not specified, then the query returns the total number of rows in the table.

In this Example if you want the number of Students in a particular Technology, 'Electronics' the query would be.

**mysql>** *SELECT* **count**(\*) *AS* TotalStudentsOfElectronics *FROM* Students *WHERE* Technology = 'Electronics';



If you want the total number of Students in all the Technology, the query would take the form: **mysql>** SELECT count(\*) AS TotalStudents FROM Students;

The output would be '12' rows.

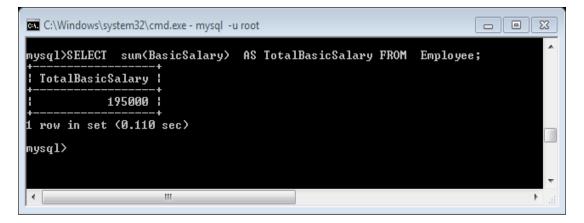
Consider the Employee table having the following records: -

Emp_I d	Name	Designation	BasicSalary	Date	ConveyanceAllowance	IncomeTax	GrossPay	NetSalary
2345	Ali   Farooq Ahmed   Faraz Ahmed	Peon   Accountant   Operator   Peon   Officer	16000 29000 23000 17000 50000	2019-10-06 2018-11-04 2017-12-14 2018-02-12 2016-03-11 2019-04-13	0 0	0 0 0 0 0	9 9 9	0 0 0 0

### SQL SUM ():

This function is used to get the sum of a numeric column. To get the total salary given out to the employees.

mysql> SELECT sum(BasicSalary) AS TotalBasicSalary FROM Employee;



# SQL AVG ():

This function is used to get the average value of a numeric column. To get the average Basic Salary were Designation is "Officer", Use the Following SQL Command:

mysql> SELECT avg(BasicSalary) AS AverageBasicSalary FROM Employee Where Designation='Officer';

C:\Windows\system32\cmd.exe - mysql -u	11000		
ysgl>SELECT avg(BasicSalary) AverageBasicSalary   55000.0000	AS AverageBasicSalary FROM	Employee Where	Designation='Officer';
row in set (0.164 sec) ysql)			

# SQL MAX ():

This function is used to get the maximum value from a column. To get the maximum salary drawn by an employee, the query would be:

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1 row in set (0.584 sec)

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C:\Windows\system32\cmd.exe - mysql -u root

mysql>SELECT max(BasicSalary) AS MaximumBasicSalary FROM Employee;

MaximumBasicSalary |
60000 |

mysql> SELECT max(BasicSalary) AS MaximumBasicSalary FROM Employee;

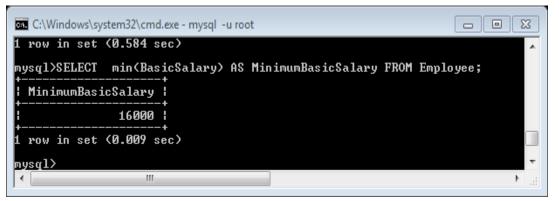
# SQL MIN ():

mysql>

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This function is used to get the minimum value from a column. To get the minimum basic salary drawn by an employee, the query would be:

mysql> SELECT min(BasicSalary) AS MinimumBasicSalary FROM Employee;



### SELECT command with SQL Expression.

SQL expression is a combination of one or more values, operators and SQL functions that results in to a value. These SQL EXPRESSIONs are similar to a formula and they are written in query language. You can also use them to query the database for a specific set of data.

In this example we calculate conveyance Allowance 20% of basic salary, use the following command

**mysql>** *SELECT* emp\_id, name, basicsalary, (basicsalary \* 20) /100 *AS* "Conveyance Allowance" *FROM* Employee;

emp_id	+   name	basicsalary	ConveyanceAllowance	+		
2345	Muhammad Ali Zeeshan Ali Faroog Ahmed Faraz Ahmed Ali Ahmed	16000 29000 23000	12000.0000 3200.0000 5800.0000 4600.0000 3400.0000 10000.0000			
rows in	set (0.001 sec)	·•		•		

# **DQL** with Expression and Functions

Chapter#04

If the arithmetic expression contains more than one operator, multiplication operator and division operator are evaluated first, and then addition and minus operator are evaluated. When two operators have the same priority, the expression is evaluated from left to right.

mysql>SELECT emp\_id, name, basicsalary, (basicsalary \* 20) /100 AS

> "ConveyanceAllowance", (basicsalary \* 5) /100 AS "Income Tax" FROM Employee;

	ne, basicsalary, (bas	icsalary * 20) /100 AS Conveyan	ceAllowance,(basicsalary * 5)	/100 AS IncomeTax FROM Employ	yee;
emp_id name 1   Muhammad Ali 2   Zeeshan 3   Ali 4   Faroog Ahmed 5   Faraz Ahmed 6   Ali Ahmed	basicsalary Conve 60000 16000 29000 23000 17000 50000	yanceAllowance IncomeTax 12000.0000 3000.0000 3200.0000 800.0000 5800.0000 1450.0000 4600.0000 1150.0000 3400.0000 850.0000 10000.0000 2500.0000			

# **SELECT Conditional Expressions with IF function**

**mysql**>*SELECT* emp\_id, name, basicsalary, IF (basicsalary>50000,'Grade-A', IF (basicsalary>35000,'Grade-B', IF(basicsalary>25000,'Grade-C','Grade-D'))) *AS* "Grade" *FROM* Employee;

In above SQL statements, the value of **basic salary** is tested. If it is greater 50,000 then Return "Grade-A", if it is greater 35000 then return "Grade-B", if it is greater 25000 then return "Grade-C" otherwise there is return "Grade-D" in the make logical column name is **Grade.** We write in other form at **mysql** command prompt. For example:

$\begin{array}{c} - \rangle \ IF \\ - \rangle \ IF \\ - \rangle \ IF \end{array}$	CT emp_id, na (basicsalary)50 (basicsalary)39 (basicsalary)29 M employee;	0000,'Grade-A' 5000,'Grade-B'	; ,'Grade-D'	>>> AS "Gra	ade"
id	name	•	-	+	
2 3 4 5 6	Muhammad Ali Zeeshan Ali Farooq Ahmed Faraz Ahmed Ali Ahmed set (0.001 sec)	16000 29000 23000 17000 50000	Grade-A Grade-D Grade-C Grade-D Grade-D Grade-B	+	

## Exercise

# **Theory Questions**

- 1) What is Query in SQL?
- 2) How to avoid duplicate records in a query?
- 3) What is the purpose of the condition operators BETWEEN and IN?
- 4) What is the default ordering of data using the ORDER BY clause and how could it be changed?
- 5) Define like operator in SQL.
- 6) Define five aggregate function, we use SELECT command of SQL.

# **Practical Questions**

- 1) Write a SQL query to fetch the all Students records in Technology 'Computer Information Technology'.
- 2) Write a SQL query to fetch Employee names having salary greater than, equal to 5000 and less than, or equal 10000.
- 3) Write a SQL query to find total number of Female Students of students table.
- 4) Write a query to display record of the highest salary from Employee table.
- 5) Write a query to display record of the Name is "Muhammad Ali" from Student table.

# **Objective MCQ's**

- 1) Which query will display the Name and FatherName of all students and if a student has NULL value given a Name, then it should display 'No Data Available'.
  - a) select name, fathername, nvl(name, 'No Data Abailable') from students;
  - b) select name, fathername, nvl2(name, 'No Data Abailable') from students;
  - c) select name, fathername from students;
  - d) select name, fathername, ifnull(name, 'No Data Abailable') from students;
- 2) Which aggregate function for return average of numeric column with the select command.
  - a) MAX
  - b) MIN
  - c) AVG
  - d) CONT
- 3) With SQL, how do you select all the columns from a table named "Students"?
  - a) SELECT \* FROM Students.
  - b) SELECT \*.Students
  - c) SELECT Students
  - d) SELECT [all] FROM Students

# **DQL** with Expression and Functions

- 4) With SQL, how do you select all the records from a table named "Students" where the value of the column "Name" starts with an "a"?
  - e) SELECT \* FROM Students WHERE Name LIKE 'a%'
  - f) SELECT \* FROM Students WHERE Name='a'
  - g) SELECT \* FROM Students WHERE Name LIKE '%a'
  - h) SELECT \* FROM Students WHERE Name='%a%'
- 5) With SQL, how do you select all the records from a table named "Students" where the value of the column "Name" is "Muhammad Ali"?
  - a) SELECT \* FROM Students WHERE Name="Muhammad Ali"
  - b) SELECT \* FROM Students WHERE Name<>"Muhammad Ali"
  - c) SELECT [all] FROM Students s WHERE Name="Muhammad Ali"
  - d) SELECT [all] FROM Students WHERE Name LIKE "Muhammad Ali"
- 6) With SQL, how do you select all the records from a table named "Students" where the "Name" is "Asif" and the "FatherName" is "Arif"?
  - a) SELECT \* FROM Students WHERE Name='Asif' AND FatherName='Arif'
  - b) SELECT \* FROM Students WHERE Name<>'Asif' AND FatherName<>'Arif'
  - c) SELECT Name='Asif', FatherName='Arif' FROM Students
  - d) SELECT \* from Students
- 7) Which SQL keyword is used to sort the result-set?
  - a) ORDER BY
  - b) SORT BY
  - c) SORT
  - d) ORDER
- 8) With SQL, how can you return the number of records in the "Students" table?
  - a) SELECT COUNT(\*) FROM Students
  - b) SELECT NO(\*) FROM Students
  - c) SELECT LEN(\*) FROM Students
  - d) SELECT COLUMNS(\*) FROM Students
- 9) Which operator is used to select values within a range?
  - a) BETWEEN
  - b) WITHIN
  - c) RANGE
  - d) IN

10) Which operator is used to search for a specified pattern in a column?

- a) LIKE
- b) GET
- c) FROM
- d) BETWEEN