**Lab manual # 2**

**SQL DML Commands**

SQL can be divided into four parts: The Data Manipulation Language (DML), the Data Definition Language (DDL), Data Control Language (DCL) and Transaction control language (TCL).

The DDL part of SQL permits database tables to be created or deleted. It also define indexes (keys), specify links between tables, and impose constraints between tables.

The most important DDL statements in SQL are:

* **CREATE DATABASE** - creates a new database
* **ALTER DATABASE** - modifies a database
* **CREATE TABLE** - creates a new table
* **ALTER TABLE** - modifies a table
* **DROP TABLE** - deletes a table
* **CREATE INDEX** - creates an index (search key)
* **DROP INDEX** - deletes an index

Examples of DML statements are:

* **SELECT** - extracts data from a database
* **UPDATE** - updates data in a database
* **DELETE** - deletes data from a database
* **INSERT INTO** - inserts new data into a database

# Queries and Commands from DML part of SQL

# SQL INSERT INTO Statement

The INSERT INTO statement is used to insert new record or row in a table.

## SQL INSERT INTO Syntax

It is possible to write the INSERT INTO statement in two forms.

The first form doesn't specify the column names where the data will be inserted, only their values:

INSERT INTO table\_name

VALUES (value1, value2, value3,...) ;

The second form specifies both the column names and the values to be inserted:

INSERT INTO table\_name (column1, column2, column3,...) VALUES (value1, value2, value3,...)

## SQL INSERT INTO Example

We have the following "Persons" table:

| **P\_Id** | **LastName** | **FirstName** | **Address** | **City** |
| --- | --- | --- | --- | --- |
| 1 | Hansen | Christ | Timoteivn 10 | Sandnes |
| 2 | Svendson | Tove | Borgvn 23 | Sandnes |
| 3 | Pettersen | Michael | Storgt 20 | Stavanger |

Now we want to insert a new row in the "Persons" table.

We use the following SQL statement:

INSERT INTO Persons

VALUES (4,'Nilsen', 'Johan', 'Bakken 2', 'Stavanger')

The "Persons" table will now look like this:

| **P\_Id** | **LastName** | **FirstName** | **Address** | **City** |
| --- | --- | --- | --- | --- |
| 1 | Hansen | Christ | Timoteivn 10 | Sandnes |
| 2 | Svendson | Tove | Borgvn 23 | Sandnes |
| 3 | Pettersen | Michael | Storgt 20 | Stavanger |
| 4 | Nilsen | Johan | Bakken 2 | Stavanger |

## Insert Data Only in Specified Columns

It is also possible to only add data in specific columns.

The following SQL statement will add a new row, but only add data in the "P\_Id", "LastName" and the "FirstName" columns:

INSERT INTO Persons (P\_Id, LastName, FirstName) VALUES (5, 'Tjessem', 'Jakob')

The "Persons" table will now look like this:

| **P\_Id** | **LastName** | **FirstName** | **Address** | **City** |
| --- | --- | --- | --- | --- |
| 1 | Hansen | Christ | Timoteivn 10 | Sandnes |
| 2 | Svendson | Tove | Borgvn 23 | Sandnes |
| 3 | Pettersen | Michael | Storgt 20 | Stavanger |
| 4 | Nilsen | Johan | Bakken 2 | Stavanger |
| 5 | Tjessem | Jakob |  |  |

# SQL UPDATE Statement

The UPDATE statement is used to update records in a table

The UPDATE statement is used to update existing records in a table.

## SQL UPDATE Syntax

UPDATE table\_name

SET column1=value, column2=value2,...

WHERE some\_column=some\_value

**Note:** Notice the WHERE clause in the UPDATE syntax. The WHERE clause specifies which record or records that should be updated. If you omit the WHERE clause, all records will be updated!

## SQL UPDATE Example

The "Persons" table:

| **P\_Id** | **LastName** | **FirstName** | **Address** | **City** |
| --- | --- | --- | --- | --- |
| 1 | Hansen | Christ | Timoteivn 10 | Sandnes |
| 2 | Svendson | Tove | Borgvn 23 | Sandnes |
| 3 | Pettersen | Michael | Storgt 20 | Stavanger |
| 4 | Nilsen | Johan | Bakken 2 | Stavanger |
| 5 | Micheal | John |  |  |

Now we want to update the person "Tjessem, Jakob" in the "Persons" table.

We use the following SQL statement:

UPDATE Persons

SET Address='Nissestien 67', City='Chicago'

WHERE LastName='Micheal' AND FirstName='John'

The "Persons" table will now look like this:

| **P\_Id** | **LastName** | **FirstName** | **Address** | **City** |
| --- | --- | --- | --- | --- |
| 1 | Hansen | Christ | Timoteivn 10 | Sandnes |
| 2 | Svendson | Tove | Borgvn 23 | Sandnes |
| 3 | Pettersen | Michael | Storgt 20 | Stavanger |
| 4 | Nilsen | Johan | Bakken 2 | Stavanger |
| 5 | Micheal | John | Nissestien 67 | Chicago |

## SQL UPDATE Warning

Be careful when updating records. If we had omitted the WHERE clause in the example above, like this:

UPDATE Persons

SET Address='Nissestien 67', City='Sandnes'

The "Persons" table would have looked like this:

| **P\_Id** | **LastName** | **FirstName** | **Address** | **City** |
| --- | --- | --- | --- | --- |
| 1 | Hansen | Christ | Nissestien 67 | Sandnes |
| 2 | Svendson | Tove | Nissestien 67 | Sandnes |
| 3 | Pettersen | Michael | Nissestien 67 | Sandnes |
| 4 | Nilsen | Johan | Nissestien 67 | Sandnes |
| 5 | Tjessem | Jakob | Nissestien 67 | Sandnes |

# SQL DELETE Statement

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

## SQL DELETE Syntax

DELETE FROM table\_name

WHERE some\_column=some\_value

**Note:** Notice the WHERE clause in the DELETE syntax. The WHERE clause specifies which record or records that should be deleted. If you omit the WHERE clause, all records will be deleted!

## SQL DELETE Example

The "Persons" table:

| **P\_Id** | **LastName** | **FirstName** | **Address** | **City** |
| --- | --- | --- | --- | --- |
| 1 | Hansen | Christ | Timoteivn 10 | Sandnes |
| 2 | Svendson | Tove | Borgvn 23 | Sandnes |
| 3 | Pettersen | Michael | Storgt 20 | Stavanger |
| 4 | Nilsen | Johan | Bakken 2 | Stavanger |
| 5 | Tjessem | Jakob | Nissestien 67 | Sandnes |

Now we want to delete the person "Tjessem, Jakob" in the "Persons" table.

We use the following SQL statement:

DELETE FROM Persons

WHERE LastName='Tjessem' AND FirstName='Jakob'

The "Persons" table will now look like this:

| **P\_Id** | **LastName** | **FirstName** | **Address** | **City** |
| --- | --- | --- | --- | --- |
| 1 | Hansen | Christ | Timoteivn 10 | Sandnes |
| 2 | Svendson | Tove | Borgvn 23 | Sandnes |
| 3 | Pettersen | Michael | Storgt 20 | Stavanger |
| 4 | Nilsen | Johan | Bakken 2 | Stavanger |

## Delete All Rows

It is possible to delete all rows in a table without deleting the table. This means that the table structure, attributes, and indexes will be intact:

| DELETE FROM table\_name or  DELETE \* FROM table\_name |
| --- |

**Note:** Be very careful when deleting records. You cannot undo this statement!

# SQL SELECT Statement

The SELECT statement is used to select data from a database.The result is stored in a result table, called the result-set.

The syntax used for SELECT query is:

SELECT column\_name(s) FROM table\_name

OR

SELECT \* FROM table\_name

**Note:** SQL is not case sensitive. SELECT is the same as select.

## Example

The "Persons" table:

| **P\_Id** | **LastName** | **FirstName** | **Address** | **City** |
| --- | --- | --- | --- | --- |
| 1 | Hansen | Christ | Timoteivn 10 | Sandnes |
| 2 | Svendson | Tove | Borgvn 23 | Sandnes |
| 3 | Pettersen | Michael | Storgt 20 | Stavanger |

Now we want to select the content of the columns named "LastName" and "FirstName" from the table above.

We use the following SELECT statement:

SELECT LastName,FirstName FROM Persons

The result-set will look like this:

| **LastName** | **FirstName** |
| --- | --- |
| Hansen | Christ |
| Svendson | Tove |
| Pettersen | Michael |

# SELECT \* Example

Now we want to select all the columns from the "Persons" table.

We use the following SELECT statement:

SELECT \* FROM Persons

**Tip:** The asterisk (\*) is a quick way of selecting all columns! The result-set will look like this:

| **P\_Id** | **LastName** | **FirstName** | **Address** | **City** |
| --- | --- | --- | --- | --- |
| 1 | Hansen | Christ | Timoteivn 10 | Sandnes |
| 2 | Svendson | Tove | Borgvn 23 | Sandnes |
| 3 | Pettersen | Michael | Storgt 20 | Stavanger |

# The SQL SELECT DISTINCT Statement

In a table, some of the columns may contain duplicate values. This is not a problem, however, sometimes you will want to list only the different (distinct) values in a table.

The DISTINCT keyword can be used to return only distinct (different) values.

Its Syntax is:

SELECT DISTINCT column\_name(s)

FROM table\_name

## Example

The "Persons" table:

| **P\_Id** | **LastName** | **FirstName** | **Address** | **City** |
| --- | --- | --- | --- | --- |
| 1 | Hansen | Christ | Timoteivn 10 | Sandnes |
| 2 | Svendson | Tove | Borgvn 23 | Sandnes |
| 3 | Pettersen | Michael | Storgt 20 | Stavanger |

Now we want to select only the distinct values from the column named "City" from the table above.

We use the following SELECT statement:

SELECT DISTINCT City FROM Persons

The result-set will look like this:

| **City** |
| --- |
| Sandnes |
| Stavanger |

# The WHERE Clause

The WHERE clause is used to extract only those records that fulfill a specified criterion. The syntax of the command is:

SELECT column\_name(s)

FROM table\_name

WHERE column\_name operator value

## Example

The "Persons" table:

| **P\_Id** | **LastName** | **FirstName** | **Address** | **City** |
| --- | --- | --- | --- | --- |
| 1 | Hansen | Christ | Timoteivn 10 | Sandnes |
| 2 | Svendson | Tove | Borgvn 23 | Sandnes |
| 3 | Pettersen | Michael | Storgt 20 | Stavanger |

Now we want to select only the persons living in the city "Sandnes" from the table above.

We use the following SELECT statement:

SELECT \* FROM Persons

WHERECity='Sandnes'

The result-set will look like this:

| **P\_Id** | **LastName** | **FirstName** | **Address** | **City** |
| --- | --- | --- | --- | --- |
| 1 | Hansen | Christ | Timoteivn 10 | Sandnes |
| 2 | Svendson | Tove | Borgvn 23 | Sandnes |

# Quotes Around Text Fields

SQL uses single quotes around text values (most database systems will also accept double quotes).

Although, numeric values should not be enclosed in quotes.

For text values:

**This is correct:**

SELECT \* FROM Persons WHERE FirstName='Tove'

**This is wrong:**

SELECT \* FROM Persons WHERE FirstName=Tove

For numeric values:

**This is correct:**

SELECT \* FROM Persons WHERE Year=1965

**This is wrong:**

SELECT \* FROM Persons WHERE Year='1965'

# Operators Allowed in the WHERE Clause

With the WHERE clause, the following operators can be used:

| **Operator** | **Description** |
| --- | --- |
| = | Equal |
| <> | Not equal |
| > | Greater than |
| < | Less than |
| >= | Greater than or equal |
| <= | Less than or equal |
| BETWEEN | Between an inclusive range |
| LIKE | Search for a pattern |
| IN | If you know the exact value you want to return for at least one of the columns |

**Note:** In some versions of SQL the <> operator may be written as !=

# The AND & OR Operators

The AND & OR operators are used to filter records based on more than one condition.

The AND operator displays a record if both the first condition and the second condition is true.

The OR operator displays a record if either the first condition or the second condition is true.

# AND Operator Example

The "Persons" table:

| **P\_Id** | **LastName** | **FirstName** | **Address** | **City** |
| --- | --- | --- | --- | --- |
| 1 | Hansen | Christ | Timoteivn 10 | Sandnes |
| 2 | Svendson | Tove | Borgvn 23 | Sandnes |
| 3 | Pettersen | Michael | Storgt 20 | Stavanger |

Now we want to select only the persons with the first name equal to "Tove" AND the last name equal to "Svendson":

We use the following SELECT statement:

SELECT \* FROM Persons

WHERE FirstName='Tove'

AND LastName='Svendson'

The result-set will look like this:

| **P\_Id** | **LastName** | **FirstName** | **Address** | **City** |
| --- | --- | --- | --- | --- |
| 2 | Svendson | Tove | Borgvn 23 | Sandnes |

# OR Operator Example

Now we want to select only the persons with the first name equal to "Tove" OR the first name equal to "Christ":

We use the following SELECT statement:

SELECT \* FROM Persons

WHERE FirstName='Tove'

OR FirstName='Christ'

The result-set will look like this:

| **P\_Id** | **LastName** | **FirstName** | **Address** | **City** |
| --- | --- | --- | --- | --- |
| 1 | Hansen | Christ | Timoteivn 10 | Sandnes |
| 2 | Svendson | Tove | Borgvn 23 | Sandnes |

# Combining AND & OR

You can also combine AND and OR (use parenthesis to form complex expressions).

Now we want to select only the persons with the last name equal to "Svendson" AND the first name equal to "Tove" OR to "Christ":

We use the following SELECT statement:

SELECT \* FROM Persons WHERE

LastName='Svendson'

AND (FirstName='Tove' OR

FirstName='Christ')

The result-set will look like this:

| **P\_Id** | **LastName** | **FirstName** | **Address** | **City** |
| --- | --- | --- | --- | --- |
| 2 | Svendson | Tove | Borgvn 23 | Sandnes |

# The ORDER BY Keyword

The ORDER BY keyword is used to sort the result-set by a specified column.

The ORDER BY keyword sorts the records in ascending order by default.

If you want to sort the records in a descending order, you can use the DESC keyword.

Its syntax is:

SELECT column\_name(s)

FROM table\_name

ORDER BY column\_name(s) ASC|DESC

## Example

The "Persons" table:

| **P\_Id** | **LastName** | **FirstName** | **Address** | **City** |
| --- | --- | --- | --- | --- |
| 1 | Hansen | Christ | Timoteivn 10 | Sandnes |
| 2 | Svendson | Tove | Borgvn 23 | Sandnes |
| 3 | Pettersen | Michael | Storgt 20 | Stavanger |
| 4 | Nilsen | Tom | Vingvn 23 | Stavanger |

Now we want to select all the persons from the table above, however, we want to sort the persons by their last name.

We use the following SELECT statement:

SELECT \* FROM Persons

ORDER BY LastName

The result-set will look like this:

| **P\_Id** | **LastName** | **FirstName** | **Address** | **City** |
| --- | --- | --- | --- | --- |
| 1 | Hansen | Christ | Timoteivn 10 | Sandnes |
| 4 | Nilsen | Tom | Vingvn 23 | Stavanger |
| 3 | Pettersen | Michael | Storgt 20 | Stavanger |
| 2 | Svendson | Tove | Borgvn 23 | Sandnes |

# ORDER BY DESC Example

Now we want to select all the persons from the table above, however, we want to sort the persons descending by their last name.

We use the following SELECT statement:.

SELECT \* FROM Persons

ORDER BY LastName DESC

The result-set will look like this:

| **P\_Id** | **LastName** | **FirstName** | **Address** | **City** |
| --- | --- | --- | --- | --- |
| 2 | Svendson | Tove | Borgvn 23 | Sandnes |
| 3 | Pettersen | Michael | Storgt 20 | Stavanger |
| 4 | Nilsen | Tom | Vingvn 23 | Stavanger |
| 1 | Hansen | Christ | Timoteivn 10 | Sandnes |

**Practice all SQL commands described above for any table…!!!**

## TASK 1:

Create the following table using SQL and using the INSERT INTO command, insert the following values in the table created.

| **Name** | **Reg\_No** | **Courses** | **Course\_Code** | **Offered\_By** |
| --- | --- | --- | --- | --- |
| Ali | 01 | DIP | 1001 | Mr. A |
| Basit | 02 | DBMS | 1002 | Mr. X |
| Akram | 03 | OS | 1003 | Mr. Y |
| Asad | 04 | DBMS | 1002 | Mr. X |
| Zeeshan | 05 | DIP | 1001 | Mr. A |
| Muneer | 06 | OS | 1003 | Mr. Y |
| Shafqat | 07 | NM | 1004 | Mr. H |
| Ahsan | 08 | OS | 1003 | Mr. Y |
| Ikram | 09 | DIP |  |  |
| Hassan | 10 |  |  |  |

## TASK 2:

Using the UPDATE statement, update the above table for the following values:

| **Name** | **Reg\_No** | **Courses** | **Course\_Code** | **Offered\_By** |
| --- | --- | --- | --- | --- |
| Ali | 01 | DIP | 1001 | Mr. A |
| Basit | 02 | DBMS | 1002 | Mr. X |
| Akram | 03 | OS | 1003 | Mr. Y |
| Asad | 04 | DBMS | 1002 | Mr. X |
| Zeeshan | 05 | DIP | 1001 | Mr. A |
| Muneer | 06 | OS | 1003 | Mr. Y |
| Shafqat | 07 | NM | 1004 | Mr. H |
| Ahsan | 08 | OS | 1003 | Mr. Y |
| Ikram | 09 | DIP | 1001 | Mr. A |
| Hassan | 10 | DSP | 1005 | Mr. Z |

## TASK 3:

Using the DELETE statement, delete the record for the student having name Akram and Ahsan in the above table. Also delete the record for the course having course code=1001.

## TASK 4:

Select distinct values from the above table for the last three columns.

## TASK 5:

Sort the above table in descending order by their name.