

4. TCL: Transaction Control Language

Transaction Control Language (TCL) commands are used to manage transactions in the database. These are used to manage the changes made to the data in a table by DML statements. It also allows statements to be grouped together into logical transactions.

These commands are to keep a check on other commands and their effect on the database. These commands can annul changes made by other commands by rolling the data back to its original state. It can also make any temporary change permanent

Note: before TCL command use we change/set option that is `[SET AUTOCOMMIT = 0;]`

COMMIT command

COMMIT command is used to permanently save any transaction into the database. When we use any DML command like INSERT, UPDATE or DELETE, the changes made by these commands are not permanent, until the current session is closed, the changes made by these commands can be rolled back. To avoid that, we use the COMMIT command to mark the changes as permanent.

Syntax

COMMIT;

Example

Consider the following Records.

```

mysql>select * from students;
+-----+-----+-----+-----+-----+-----+
| Roll | Name      | FatherName | DateOfAdmin | Gender | Technology |
+-----+-----+-----+-----+-----+-----+
| 1    | Asif Khan | Atif Khan  | 2019-11-20  | Male   | Software Engineering |
| 2    | Muhammad Ali | Hasan 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 (0.000 sec)

mysql>
    
```

mysql> BEGIN;

mysql> UPDATE Students SET Name = 'Ahsan' WHERE Name = 'Asif Khan'; ←

```

C:\> Mark Command Prompt - mysql -u root
mysql>begin;
Query OK, 0 rows affected (0.000 sec)

mysql>update students set name="Ahsan" where name="asif Khan";
Query OK, 2 rows affected (0.037 sec)
Rows matched: 2  Changed: 2  Warnings: 0

mysql>select * from students;
+----+-----+-----+-----+-----+-----+
| Roll | Name      | FatherName | DateOfAdmin | Gender | Technology |
+----+-----+-----+-----+-----+-----+
| 1    | Ahsan     | Atif Khan  | 2019-11-20  | Male   | Software Engineering |
| 2    | Muhammad Ali | Hasan Ali  | 2018-12-23  | Male   | Information Technology |
| 3    | Ahsan     | 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 (0.000 sec)

mysql>^A

```

mysql> **COMMIT;**

mysql> **ROLLBACK;**

mysql> **SELECT * FROM Students;**

```

C:\> Mark Command Prompt - mysql -u root
mysql>COMMIT;
Query OK, 0 rows affected (0.042 sec)

mysql>ROLLBACK;
Query OK, 0 rows affected (0.000 sec)

mysql>select * from students;
+----+-----+-----+-----+-----+-----+
| Roll | Name      | FatherName | DateOfAdmin | Gender | Technology |
+----+-----+-----+-----+-----+-----+
| 1    | Ahsan     | Atif Khan  | 2019-11-20  | Male   | Software Engineering |
| 2    | Muhammad Ali | Hasan Ali  | 2018-12-23  | Male   | Information Technology |
| 3    | Ahsan     | 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 (0.001 sec)

mysql>

```

By using the above set of instructions, you can update the wrong student name by the correct one and save it permanently in the database. The update transaction gets completed when commit is used. If commit is not used, then there will be lock on **'Asif Khan'** record till the rollback or commit is issued.

Now have a look at the below table where **'Asif Khan'** is updated and there is a lock on his record. The updated value is permanently saved by **"Ahsan"** in the database after the use of commit and lock is released.

```
mysql>select * from students;
```

Roll	Name	FatherName	DateOfAdmin	Gender	Technology
1	Ahsan	Atif Khan	2019-11-20	Male	Software Engineering
2	Munammad Ali	Hasan Ali	2018-12-23	Male	Information Technology
3	Ahsan	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 (0.000 sec)

mysql>
```

ROLLBACK [TO SavePointName] command

This command is used when the user realizes that he has updated the wrong information after the student name and wants to undo this update. The users can issues ROLLBACK command and then undo the update. Have a look at the below tables to know better about the implementation of this command.

```
mysql> BEGIN;
```

```
mysql> UPDATE Students SET Name = 'Asif Khan' WHERE Name = 'Ahsan'; ←
```

```
mysql> SELECT * FROM STUDENTS;
```

```
mysql>select * from students;
```

Roll	Name	FatherName	DateOfAdmin	Gender	Technology
1	Ahsan	Atif Khan	2019-11-20	Male	Software Engineering
2	Muhammad Ali	Hasan Ali	2018-12-23	Male	Information Technology
3	Ahsan	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 (0.000 sec)

mysql>BEGIN;
Query OK, 0 rows affected (0.000 sec)

mysql>UPDATE STUDENTS SET NAME="Asif Khan" WHERE NAME="Ahsan";
Query OK, 2 rows affected (0.013 sec)
Rows matched: 2 Changed: 2 Warnings: 0

mysql>
```

We will see that two record change of Roll number 1 and 3 because two name are Ahsan now “Ahsan” replace by “Asif Khan”. After ROLLBACK command use we will see undo update command and restore previous data.

```
mysql>select * from students;
```

Roll	Name	FatherName	DateOfAdmin	Gender	Technology
1	Asif Khan	Atif Khan	2019-11-20	Male	Software Engineering
2	Muhammad Ali	Hasan 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 (0.000 sec)

mysql>
```

After use ROLLBACK commands we will see below screen.

mysql> ROLLBACK;

```
ca. Select Command Prompt - mysql -u root
Mysql>ROLLBACK;
Query OK, 0 rows affected (0.041 sec)

Mysql>SELECT * FROM STUDENTS;
```

Roll	Name	FatherName	DateOfAdmin	Gender	Technology
1	Ahsan	Atif Khan	2019-11-20	Male	Software Engineering
2	Muhammad Ali	Hasan Ali	2018-12-23	Male	Information Technology
3	Ahsan	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 (0.000 sec)

Mysql>
```

SAVEPOINT

This command restores the database to last committed state. It is also used with SAVEPOINT command to jump to a save point in an ongoing transaction. If we have used the UPDATE command to make some changes into the database, and realize that those changes were not required, then we can use the ROLLBACK command to rollback those changes, if they were not committed using the COMMIT command.

Syntax

SAVEPOINT <SavePointName>

Example

Consider the following Records.

```

C:\> Select Command Prompt - mysql -u root
mysql>select * from students;
+----+-----+-----+-----+-----+-----+
| Roll | Name      | FatherName | DateOfAdmin | Gender | Technology |
+----+-----+-----+-----+-----+-----+
| 1 | Asif Khan | Atif Khan  | 2019-11-20  | Male   | Software Engineering |
| 2 | Muhammad Ali | Hasan 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 (0.000 sec)

mysql>
    
```

mysql> UPDATE Students Set Name ="Adnan" WHERE FatherName ="Atif Khan";

mysql> SAVEPOINT A;

mysql> UPDATE Students Set Name ="Muhammad" WHERE FatherName ="Imran Khan";

mysql> SAVEPOINT B;

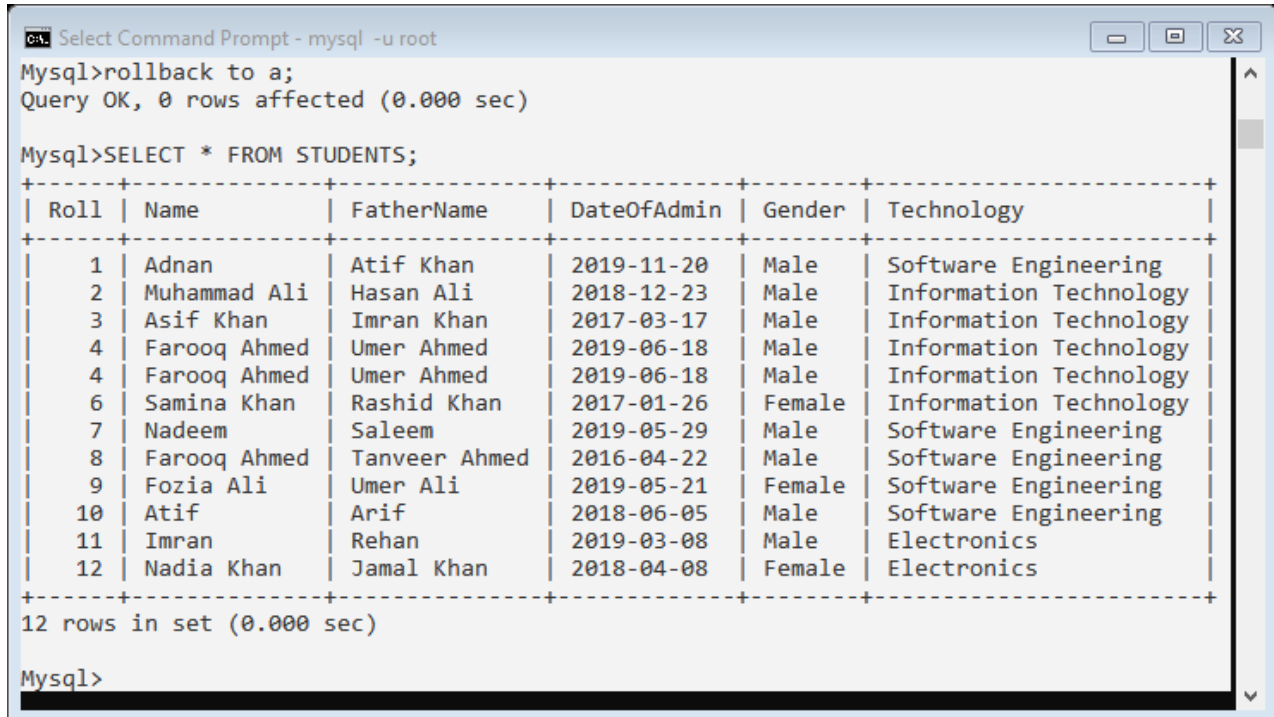
```

C:\> Select Command Prompt - mysql -u root
Mysql>SELECT * FROM STUDENTS;
+----+-----+-----+-----+-----+-----+
| Roll | Name      | FatherName | DateOfAdmin | Gender | Technology |
+----+-----+-----+-----+-----+-----+
| 1 | Adnan     | Atif Khan  | 2019-11-20  | Male   | Software Engineering |
| 2 | Muhammad Ali | Hasan Ali  | 2018-12-23  | Male   | Information Technology |
| 3 | Muhammad  | 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 (0.000 sec)

Mysql>
    
```

In short, using this command we can name the different states of our data in any table and then rollback to that state using the ROLLBACK command whenever required. If we want state point **A** then we use **ROLLBACK to A** command then we will see blow output.

mysql> ROLLBACK TO A;



```
ca. Select Command Prompt - mysql -u root
Mysql>rollback to a;
Query OK, 0 rows affected (0.000 sec)

Mysql>SELECT * FROM STUDENTS;
+-----+-----+-----+-----+-----+-----+
| Roll | Name          | FatherName | DateOfAdmin | Gender | Technology |
+-----+-----+-----+-----+-----+-----+
| 1    | Adnan         | Atif Khan  | 2019-11-20  | Male   | Software Engineering |
| 2    | Muhammad Ali | Hasan 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 (0.000 sec)

Mysql>
```

Exercise

Theory Questions

- 1) What is purpose of transection control language (TCL) Commands of SQL?
- 2) How many commands and write list of commands of TCL?

Practical Questions

- 1) Remove all record from table students and use after this command, restore all deleted records.
- 2) Insert new 2 records in the table students at different save point state and restore first state of save point.

Objective and MCQ's

- 1) Which of the following are TCL commands?
 - a) UPDATE and TRUNCATE
 - b) SELECT and INSERT
 - c) GRANT and REVOKE
 - d) ROLLBACK and SAVEPOINT
- 2) _____ is not a category of SQL command.
 - a) TCL
 - b) SCL
 - c) DCL
 - d) DDL
- 3) Which of the following command makes the updates performed by the transaction permanent in the database.
 - a) ROLLBACK
 - b) COMMIT
 - c) TRUNCATE
 - d) DELETE
- 4) Which command undo all the updates performed by the SQL in the transaction.
 - a) Rollback
 - b) Commit
 - c) Truncate
 - d) Delete
- 5) TCL stands for:
 - a) Transaction control languages
 - b) Transaction command languages
 - c) Transaction connect languages
 - d) None of the Mentioned