# 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.

🖾 Select Command Prompt - mysql -u root								
<pre>mysql&gt;select * from students; ^</pre>								
Roll   Name	FatherName	DateOfAdmin	Gender	Technology				
1   Asif Khan 2   Muhammad Ali 3   Asif Khan 4   Farooq Ahmed 4   Farooq Ahmed 6   Samina Khan 7   Nadeem 8   Farooq Ahmed 9   Fozia Ali 10   Atif 11   Imran 12   Nadia Khan	Atif Khan   Hasan Ali   Imran Khan   Umer Ahmed   Umer Ahmed   Rashid Khan   Saleem   Tanveer Ahmed   Umer Ali   Arif   Rehan   Jamal Khan	2019-11-20 2018-12-23 2017-03-17 2019-06-18 2019-06-18 2019-05-29 2016-04-22 2019-05-21 2018-06-05 2019-03-08 2018-04-08	Male   Male   Male   Male   Female   Male   Female   Male   Male   Male   Male	Software Engineering Information Technology Information Technology Information Technology Information Technology Information Technology Software Engineering Software Engineering Software Engineering Electronics Electronics				
12 rows in set (0.000 mysql>	sec)	-	-					



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

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Mark Command Pro	mpt - mysql -u root					
mysql>begin; Query OK, Ø 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	i	
1       Ahsan         2       Muhamma         3       Ahsan         4       Farooq         4       Farooq         6       Samina         7       Nadeem         8       Farooq         9       Fozia A         10       Atif         11       Imran         12       rows in set (1)	Atif Khan Atif Khan I Ali Hasan Ali Imran Khan Ahmed Umer Ahmed Ahmed Rashid Khan Saleem Ahmed I Tanveer Ahmed I Tanveer Ahmed I Rehan han Jamal Khan 3.000 sec>	$\begin{array}{c} 2019-11-20\\ 2018-12-23\\ 2017-03-17\\ 2019-06-18\\ 2019-06-18\\ 2019-05-29\\ 2016-04-22\\ 2019-05-29\\ 2016-04-22\\ 2019-05-21\\ 2018-06-05\\ 2018-06-05\\ 2018-04-08\\ 2018-04-08\\ \end{array}$	Male Male Male Female Male Female Male Male Female Female	Software Engineering Information Technology Information Technology Information Technology Information Technology Software Engineering Software Engineering Software Engineering Software Engineering Electronics	*	
mysql>^A					-	
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## mysql> COMMIT;

#### mysql> ROLLBACK;

## mysql> SELECT \* FROM Students;

👞 Mark C	ommand Prompt - my	sql -u root					
mysql>C	OMMIT; K Ø vous affec:	ted (0.042 sec)				*	
query OK, 0 rows affected (0.042 sec) mysql>ROLLBACK; Query OK, 0 rows affected (0.000 sec)							
mysql≻s	elect * from st	udents;					
Roll	 Name	FatherName	DateOfAdmin	Gender	Technology	•	
1 2 3 4 4 6 7 8 9 10 11 11	Ahsan   Muhammad Ali   Ahsan   Faroog Ahmed   Faroog Ahmed   Samina Khan   Nadeem   Faroog Ahmed   Fozia Ali   Atif   Imran   Nadia Khan	Atif Khan Hasan Ali Imran Khan Umer Ahmed Umer Ahmed Rashid Khan Saleem Tanveer Ahmed Umer Ali Arif Rehan Jamal Khan	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Male Male Male Male Female Male Female Male Female Female	Software Engineering Information Technology Information Technology Information Technology Information Technology Software Engineering Software Engineering Software Engineering Software Engineering Electronics	E	
12 rows	in set (0.001 :	sec)					
mysql>						Ψ.	
		III				E 1	

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.

/sql>se	elect * from stu	udents;			
Roll	Name	FatherName	DateOfAdmin	Gender	Technology
1	Ahsan	Atif Khan	2019-11-20	Male	Software Engineering
2	Munammad All	Hasan All	2018-12-23	мате	Information rechnology
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
					+
2 rows	in set (0.000 s	sec)			
	-	-			

## 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;

Mark Command Prompt - mys	ql-u root				8	
mysql>select * from stu	dents;			•*	*	
Roll Name	FatherName	DateOfAdmin	Gender	Technology		
1Ahsan2Muhammad Ali3Ahsan4Farooq Ahmed4Farooq Ahmed6Samina Khan7Nadeem8Farooq Ahmed9Fozia Ali10Atif11Imran12Nadia Khan	Atif Khan Hasan Ali Imran Khan Umer Ahmed Umer Ahmed Rashid Khan Saleem Tanveer Ahmed Umer Ali Arif Rehan Jamal Khan	$\begin{array}{c} 2019-11-20\\ 2018-12-23\\ 2017-03-17\\ 2019-06-18\\ 2019-06-18\\ 2019-06-18\\ 2019-05-29\\ 2016-04-22\\ 2019-05-21\\ 2018-06-05\\ 2019-03-08\\ 2018-04-08\\ \end{array}$	Male Male Male Male Female Male Female Male Male Female	Software Engineering Information Technology Information Technology Information Technology Information Technology Software Engineering Software Engineering Software Engineering Software Engineering Electronics		
12 rows in set (0.000 s	ec)					
mysql>BEGIN; Query OK, Ø rows affect	ed (0.000 sec)				Ш	
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 musql>						
(	III				▶	

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 1 2 3 4 4 6 7 8 9 10 11	Asif Khan Muhammad Ali Asif Khan Faroog Ahmed Samina Khan Nadeem Faroog Ahmed Fozia Ali Atif Imran Nadia Khan	Atif Khan Hasan Ali Imran Khan Umer Ahmed War Ahmed Bashid Khan Saleem Tanveer Ahmed Umer Ali Arif Rehan Jamal Khan	$\begin{array}{c} 2019 - 11 - 20 \\ 2018 - 12 - 23 \\ 2017 - 03 - 17 \\ 2019 - 06 - 18 \\ 2019 - 06 - 18 \\ 2019 - 06 - 18 \\ 2019 - 05 - 29 \\ 2019 - 05 - 29 \\ 2016 - 04 - 22 \\ 2019 - 05 - 21 \\ 2018 - 06 - 05 \\ 2018 - 06 - 08 \\ 2018 - 04 - 08 \\ \end{array}$	Male Male Male Female Male Female Female Male Female Female	Software Engineering Information Technology Information Technology Information Technology Information Technology Software Engineering Software Engineering Software Engineering Software Engineering Electronics			
12 rows	12 rows in set (0.000 sec)							
mysql>							Ŧ	
		III				•	.::	

After use ROLLBACK commands we will see below screen.

#### mysql> ROLLBACK;

Select Command Prompt - mysql -u root							
Mysql>R	Mysql>ROLLBACK;						
Query of	, o rows arrect	10.041 320)					
Mysql>S	ELECT * FROM STU	JDENTS;					
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 s	sec)					
Mysq1>					· · · · · · · · · · · · · · · · · · ·	1	

## 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.

Select (	🖬 Select Command Prompt - mysql -u root							
mysql>select * from students;								
+   Roll	+   Name	FatherName	DateOfAdmin	Gender	Technology			
1 2 3 4 4 6 7 8 9 10 11 12 12 rows	Asif Khan Muhammad Ali Asif Khan Farooq Ahmed Samina Khan Nadeem Farooq Ahmed Fozia Ali Atif Imran Nadia Khan	Atif Khan Hasan Ali Imran Khan Umer Ahmed Umer Ahmed Rashid Khan Saleem Tanveer Ahmed Umer Ali Arif Rehan Jamal Khan	2019-11-20 2018-12-23 2017-03-17 2019-06-18 2019-06-18 2019-05-29 2016-04-22 2019-05-21 2018-06-05 2019-03-08 2018-04-08	Male Male Male Male Female Male Female Male Female Female	Software Engineering Information Technology Information Technology Information Technology Information Technology Information Technology Software Engineering Software Engineering Software Engineering Electronics Electronics	-		
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;

Select	🖼 Select Command Prompt - mysql -u root 🗖 💷 🖾						
Mysql>S	ELECT * FROM STU	JDENTS;				^	
+   Roll	+   Name +	+ FatherName	+ DateOfAdmin	Gender	Technology		
1   2   3   4   6   7   8   9   10   11   12 +	Adnan   Muhammad Ali   Muhammad   Farooq Ahmed   Farooq Ahmed   Samina Khan   Nadeem   Farooq Ahmed   Fozia Ali   Atif   Imran   Nadia Khan +	Atif Khan   Hasan Ali   Imran Khan   Umer Ahmed   Umer Ahmed   Rashid Khan   Saleem   Tanveer Ahmed   Umer Ali   Arif   Rehan   Jamal Khan	2019-11-20 2018-12-23 2017-03-17 2019-06-18 2019-06-18 2019-06-18 2019-05-29 2016-04-22 2019-05-21 2018-06-05 2019-03-08 2018-04-08	Male Male Male Male Female Male Female Male Male Female	Software Engineering Information Technology Information Technology Information Technology Information Technology Information Technology Software Engineering Software Engineering Software Engineering Electronics Electronics		
Mysql>						$\sim$	

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;

Select Com	mand Prompt - my	/sql -u root				3
Mysql>rollback to a;						
Query OK, 6	o rows arrect	ea (0.000 sec)				
Mysql>SELEC	CT * FROM STU	IDENTS;				
++	+ ame	FatherName	DateOf∆dmin	Gender	Technology	
++	+	+		+	+	
1   Ac	dnan	Atif Khan	2019-11-20	Male	Software Engineering	
2   Mu	uhammad Ali	Hasan Ali	2018-12-23	Male	Information Technology	
3   As	sif Khan 🛛	Imran Khan	2017-03-17	Male	Information Technology	
4   Fa	arooq Ahmed	Umer Ahmed	2019-06-18	Male	Information Technology	
4 Fa	arooq Ahmed	Umer Ahmed	2019-06-18	Male	Information Technology	
6 Sa	amina Khan 🛛	Rashid Khan	2017-01-26	Female	Information Technology	
7   Na	adeem	Saleem	2019-05-29	Male	Software Engineering	
8 Fa	arooq Ahmed	Tanveer Ahmed	2016-04-22	Male	Software Engineering	
9 Fo	ozia Ali	Umer Ali	2019-05-21	Female	Software Engineering	
10 At	tif	Arif	2018-06-05	Male	Software Engineering	
11   In	nran	Rehan	2019-03-08	Male	Electronics	
12   Na	adia Khan	Jamal Khan	2018-04-08	Female	Electronics	
++	+			+	+	
12 rows in	set (0.000 s	ec)				
Mysq1>						~

# 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