Experiment No 06: Execute TCL Commands to control transactions on data using SQL

I. **Practical Significance:** A transaction is set of Read/Write (DML) operations in a database. Transaction Control Language (TCL) Commands are used to manage transactions in a database. They help ensure data integrity by allowing you to save, undo, or partially undo changes made during a transaction. This practical allows students to execute TCL commands to control transactions on data.

II. **INDUSTRY / EMPLOYER EXPECTED OUTCOME:**
To execute TCL Commands to control transactions on data using SQL

III. **COURSE LEVEL LEARNING OUTCOMES (COS):**
CO3 - Manage database using SQL

IV. **LABORATORY LEARNING OUTCOME:**
Execute TCL Commands to control transactions on data using SQL.

V. **Relevant Affective Domain related outcome(s)**
a. Follow precautionary measures.
b. Follow installation steps.
c. Follow ethical practices.

VI. **Relevant Theoretical Background**

Transaction Control Language (TCL) Commands manage the changes made by DML statements in a database. These commands include COMMIT, ROLLBACK, and SAVEPOINT, which help in saving, undoing, and setting intermediate points within transactions, respectively.

1. COMMIT

Explanation: The COMMIT command is used to save all changes made during the current transaction to the database permanently.

Syntax:
COMMIT;

Example:
update emp
set sal = sal + 5000
where empno = 101;

After executing update command execute following TCL command :

commit;

The salary increases for the employee with empno = 101 is *saved permanently* in the database.

2. ROLLBACK
Explanation: The ROLLBACK command is used to undo changes made during the current transaction, reverting the database to its previous state.

Syntax:
ROLLBACK;

Example:
update emp
set sal = sal+ 5000
where empno = 101;

After executing update command execute following TCL command :

rollback;

The salary increases for the employee with empno = 101 is undone, and the database *returns to its state as it was before the execution of update command.*

3. SAVEPOINT
Explanation: The SAVEPOINT command is used to set a savepoint within a transaction, allowing for partial rollbacks to specific points within the transaction.

Syntax:
SAVEPOINT savepoint_name;

Example:
SAVEPOINT BeforeUpdate;

update emp
set sal = sal + 5000
where empno = 101;

rollback to BeforeUpdate;

The salary increases for the employee with EmployeeID = 101 is undone, and the

database returns to the state at the SAVEPOINT BeforeUpdate.

Summary Table

Command	Description	Syntax	Effects of TCL command
COMMIT	Save all changes made during the current transaction permanently	COMMIT;	Changes are saved permanently.
ROLLBACK	Undo changes made during the current transaction	ROLLBACK;	Changes are undone, reverting to the previous state.
SAVEPOINT	Set a savepoint within a transaction for partial rollbacks	SAVEPOINT savepoint_name;	A savepoint is created, allowing for partial rollbacks.

VII. Required Resources/apparatus/equipment with specifications

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Computer system with all necessary components like; motherboard, random access memory (RAM), read-only memory (ROM), internal hard disk drives, Mouse, Keyboard, and RDBMS applications such as Oracle Express Edition, MySql,SQLite,Oracle Live SQL etc.	All

VIII. Procedure

1. Create Database for given application
2. Create tables for the given application
3. Execute TCL Commands after DML Commands

IX. Result(s)

Here we learnt to execute TCL commands to control transaction on order using SQL

X. Practical related questions (Provide space for answers)

Note: Below are a few sample questions for reference. Teacher must design more suchquestions so as to ensure the achievement of identified CO.

1. Explain the need of TCL command in SQL
2. Differentiate between COMMIT and ROLLBACK commands in SQL

* Exercise

1] →

The TCL (Transaction control Language) Command to save all the changes made so far is the COMMIT Command.

The Commit Command is used in SQL to save all the changes made during current transaction. Commit changes are permanently applied to the database

Command:

```
COMMIT;
```

This Command will save all the changes (Insert, Update, delete) made to the emp table & any other tables.

2] →

To delete a record in the Emp table & then undo the deletion operation.

- Delete a record from the Emp table

ex: Delete a record ~~of~~ empno is 191:

```
DELETE From emp Where empno = 191;
```

- Undo the deletion operation using the Rollback Command

RollBack;

This will revert the database to its previous state before the DELETE operation was executed effectively undoing the deletion.
The deleted empno =191 is back. using RollBack Command.

3] ⟶

To set savepoint in the middle of a transaction, use Savepoint command. set a savepoint named BeforeSalary Update:

Savepoint BeforeSalaryUpdate;

This command marks a point within your transaction that you can later roll back to without affecting the preceding operations in the transaction.

3] →

The SAVEPOINT command is used to set a savepoint within a transaction allowing for partial rollback to specific points within the transaction.

Syntax:

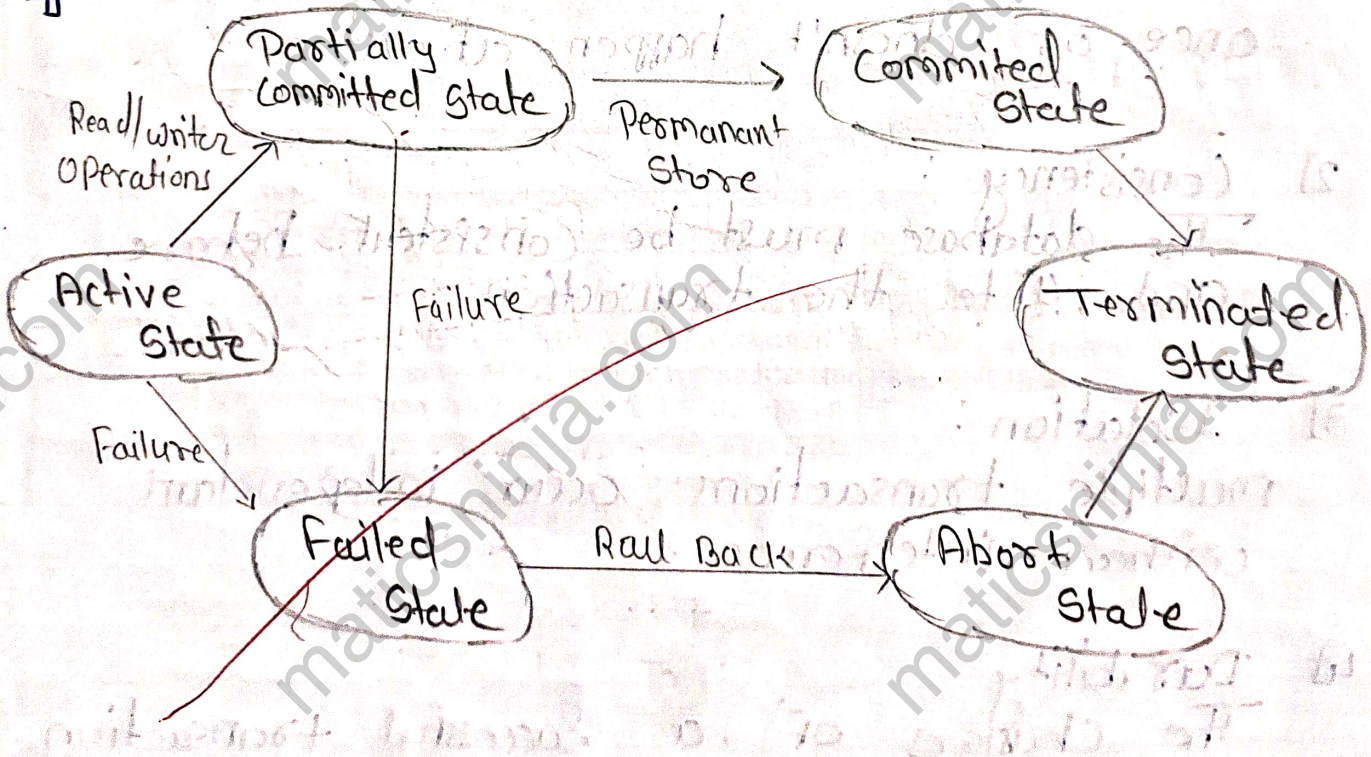
```
SAVEPOINT savepoint_name;
```

Example:

```
SAVEPOINT Before Update;
Update emp
Set Sal = Sal + 5000
where emp_no = 101;
roll_back to Before update
```

The Salary increases for the employee with Employee = 100 is undone & the database return to the state at the SAVEPOINT BeforeUpdate

4] →



There are 6 different types of transaction states
1. Active State : The transiction is executing & modifying database
2. Partially Committed : made all modification but not has confirmed
3. Failed state : The transaction has failed.
4. Aborted state : the transaction is rolled back due to failure
5. Committed state : the changes have been permanently saved
6. Terminated State : the transaction has terminated.

5] →

ACID Properties of transaction of DBMS are given below:

1] A = atomicity
2] C = consistency
3] I = Isolation
4] D = Durability

1] Automicity :
The entire transaction takes place at once or doesn't happen at all.

2] Consistency :
The database must be consistent before and after the transaction

3] Isolation :
multiple transactions occur independant without interference.

4] Durability
The changes of a successful transaction occurs even if the system failure occurs

3. Describe savepoint
4. Describe states of transaction with neat diagram
5. Describe ACID properties of transaction

(Space for answer)

1] →

TCL Command are basically used for managing & controlling the transaction in a database to maintain consistency & it also helps a user manage all the changes made by the DML commands for maintaining its transaction. TCL lets the statements get grouped into logical transaction.

2] →

Difference between COMMIT and ROLLBACK command in SQL

COMMIT	ROLLBACK
The COMMIT command is used to save all changes made during the current transaction to the database permanently	The RollBack Command is used to and o changes made during the current transaction reverting the database to its previous state.
ex: update emp set sal = sal+5000 where empo = 101	ex: update emp set sal = sal+5000 where emp no=101;

XI. Exercise

1. Write TCL command to save all the changes made so far in the EMP
2. Delete any one record in the EMP table created earlier and undo the deletion operation
3. You are in the middle of a transaction and want to set a savepoint named BeforeSalaryUpdate. Write the SQL command to set this savepoint.

XII. **References/Suggestions for further reading: include websites/links**

1. https://www.youtube.com/watch?v=LSB4eceRsw8
2. https://www.youtube.com/watch?v=yGU4YfSSjdM
3. https://www.javatpoint.com/tcl-commands-in-sql
4. https://www.programiz.com/sql/tcl-commands