Practical No. 9

Aim: Implement queries related to order by and having clause.(To perform TCL and DCL commands.).

Theory:

- ## TCL Commands:

1. **Transaction:** A transaction is a sequence of one or more SQL statements that are executed as a single unit of work. It is important for maintaining data consistency.

2. **TCL Commands**: TCL commands are used to manage transactions. The two primary TCL commands are:

3. **COMMIT:** This command is used to save all the changes made during the current transaction. It marks the successful end of a transaction.

4. **ROLLBACK:** This command is used to undo all the changes made during the current transaction and return the database to its previous state. It is used when an error or issue occurs during a transaction.

5. **SAVEPOINT:** TCL allows the use of savepoints within a transaction. A savepoint is a point in a transaction to which you can later roll back. You can use SAVEPOINT to create a savepoint within a transaction and ROLLBACK TO to revert to a specific savepoint.

- **DCL Commands:**

Data Control Language (DCL): DCL is a subset of SQL (Structured Query Language) commands used for managing access and permissions to database objects. DCL commands are focused on controlling who can access, modify, or manipulate data and database objects.

Key DCL Commands:
1. GRANT: The GRANT command is used to give specific privileges or permissions to users or roles on database objects, such as tables, views, procedures, and more. It allows you to specify what actions a user or role is allowed to perform on the specified objects.

2. REVOKE: The REVOKE command is used to take away previously granted privileges or permissions from users or roles. It is used to restrict or revoke access to database objects.

Queries:

- **TCL COMMAND:**

(1) COMMIT:

```
mysql> /*202203103510124*/
mysql> CREATE TABLE Students3 (
    ->     StudentID INT PRIMARY KEY,
    ->     FirstName VARCHAR(50),
    ->     LastName VARCHAR(50)
    -> );
Query OK, 0 rows affected (0.01 sec)

mysql>
mysql> CREATE TABLE Courses3 (
    ->     CourseID INT PRIMARY KEY,
    ->     CourseName VARCHAR(50)
    -> );
Query OK, 0 rows affected (0.01 sec)

mysql>
mysql> INSERT INTO Students3 (StudentID, FirstName, LastName)
    -> VALUES
    ->     (1, 'John', 'Doe'),
    ->     (2, 'Jane', 'Smith'),
    ->     (3, 'Tom', 'Wilson');
Query OK, 3 rows affected (0.00 sec)
Records: 3  Duplicates: 0  Warnings: 0

mysql>
mysql> INSERT INTO Courses3 (CourseID, CourseName)
    -> VALUES
    ->     (101, 'Mathematics'),
    ->     (102, 'History'),
    ->     (103, 'Science');
Query OK, 3 rows affected (0.00 sec)
Records: 3  Duplicates: 0  Warnings: 0
```

```
mysql> /*202203103510124*/
mysql> START TRANSACTION;
Query OK, 0 rows affected (0.00 sec)

mysql>
mysql> INSERT INTO Students3 (StudentID, FirstName, LastName)
    -> VALUES (4, 'Sarah', 'Johnson');
Query OK, 1 row affected (0.00 sec)

mysql>
mysql> UPDATE Courses3
    -> SET CourseName = 'English'
    -> WHERE CourseID = 102;
Query OK, 1 row affected (0.00 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql>
mysql> COMMIT;
Query OK, 0 rows affected (0.00 sec)

mysql>
mysql> SELECT * FROM Students3;
+-----------+-----------+----------+
| StudentID | FirstName | LastName |
+-----------+-----------+----------+
|         1 | John      | Doe      |
|         2 | Jane      | Smith    |
|         3 | Tom       | Wilson   |
|         4 | Sarah     | Johnson  |
+-----------+-----------+----------+
4 rows in set (0.00 sec)

mysql> SELECT * FROM Courses3;
+----------+-------------+
| CourseID | CourseName  |
+----------+-------------+
|      101 | Mathematics |
|      102 | English     |
|      103 | Science     |
+----------+-------------+
3 rows in set (0.00 sec)
```

(2) ROLLBACK:

```
mysql> /*202203103510124*/
mysql> CREATE TABLE Employees2 (
    ->     EmployeeID INT PRIMARY KEY,
    ->     FirstName VARCHAR(50),
    ->     LastName VARCHAR(50),
    ->     Salary DECIMAL(10, 2)
    -> );
Query OK, 0 rows affected (0.01 sec)

mysql>
mysql> INSERT INTO Employees2 (EmployeeID, FirstName, LastName, Salary)
    -> VALUES
    ->     (1, 'John', 'Doe', 50000.00),
    ->     (2, 'Jane', 'Smith', 60000.00),
    ->     (3, 'Tom', 'Wilson', 55000.00);
Query OK, 3 rows affected (0.00 sec)
Records: 3  Duplicates: 0  Warnings: 0
```

```
mysql> /*202203103510124*/
mysql> START TRANSACTION;
Query OK, 0 rows affected (0.00 sec)

mysql>
mysql> UPDATE Employees2
    -> SET Salary = 65000.00
    -> WHERE EmployeeID = 1;
Query OK, 1 row affected (0.00 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql>
mysql> DELETE FROM Employees2
    -> WHERE EmployeeID = 3;
Query OK, 1 row affected (0.00 sec)

mysql>
mysql> SELECT * FROM Employees2;
+------------+-----------+----------+----------+
| EmployeeID | FirstName | LastName | Salary   |
+------------+-----------+----------+----------+
|          1 | John      | Doe      | 65000.00 |
|          2 | Jane      | Smith    | 60000.00 |
+------------+-----------+----------+----------+
2 rows in set (0.00 sec)

mysql>
mysql> ROLLBACK;
Query OK, 0 rows affected (0.00 sec)

mysql>
mysql> SELECT * FROM Employees2;
+------------+-----------+----------+----------+
| EmployeeID | FirstName | LastName | Salary   |
+------------+-----------+----------+----------+
|          1 | John      | Doe      | 50000.00 |
|          2 | Jane      | Smith    | 60000.00 |
|          3 | Tom       | Wilson   | 55000.00 |
+------------+-----------+----------+----------+
3 rows in set (0.00 sec)
```

(3) SAVEPOINT:

```
mysql> /*202203103510124*/
mysql> CREATE TABLE Students4 (
    ->     StudentID INT PRIMARY KEY,
    ->     FirstName VARCHAR(50),
    ->     LastName VARCHAR(50),
    ->     GPA DECIMAL(3, 2)
    -> );
Query OK, 0 rows affected (0.01 sec)

mysql>
mysql> INSERT INTO Students4 (StudentID, FirstName, LastName, GPA)
    -> VALUES
    ->     (1, 'John', 'Doe', 3.65),
    ->     (2, 'Jane', 'Smith', 3.80),
    ->     (3, 'Tom', 'Wilson', 3.55);
Query OK, 3 rows affected (0.00 sec)
Records: 3  Duplicates: 0  Warnings: 0
```

```
mysql> /*202203103510124*/
mysql> START TRANSACTION;
Query OK, 0 rows affected (0.00 sec)

mysql>
mysql> UPDATE Students
    -> SET GPA = 3.95
    -> WHERE StudentID = 1;
ERROR 1054 (42S22): Unknown column 'GPA' in 'field list'
mysql>
mysql> SAVEPOINT before_delete;
Query OK, 0 rows affected (0.00 sec)

mysql>
mysql> DELETE FROM Students
    -> WHERE StudentID = 3;
Query OK, 1 row affected (0.00 sec)

mysql>
mysql> SELECT * FROM Students;
+-----------+-----------+----------+------+--------+
| StudentID | FirstName | LastName | Age  | Gender |
+-----------+-----------+----------+------+--------+
|         1 | John      | Smith    |   22 | Male   |
|         2 | Emily     | Johnson  |   20 | Female |
|         4 | Sophia    | Davis    |   23 | Female |
+-----------+-----------+----------+------+--------+
3 rows in set (0.00 sec)

mysql>
mysql> ROLLBACK TO before_delete;
Query OK, 0 rows affected (0.00 sec)

mysql>
mysql> SELECT * FROM Students;
+-----------+-----------+----------+------+--------+
| StudentID | FirstName | LastName | Age  | Gender |
+-----------+-----------+----------+------+--------+
|         1 | John      | Smith    |   22 | Male   |
|         2 | Emily     | Johnson  |   20 | Female |
|         3 | Michael   | Brown    |   21 | Male   |
|         4 | Sophia    | Davis    |   23 | Female |
+-----------+-----------+----------+------+--------+
4 rows in set (0.00 sec)

mysql>
mysql> COMMIT;
Query OK, 0 rows affected (0.00 sec)
```

(4) ROLLBACK TO:

```
mysql> /*202203103510124*/
mysql> START TRANSACTION;
Query OK, 0 rows affected (0.00 sec)

mysql>
mysql> UPDATE Students4
    -> SET GPA = 3.95
    -> WHERE StudentID = 1;
Query OK, 1 row affected (0.00 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql>
mysql> SAVEPOINT before_delete;
Query OK, 0 rows affected (0.00 sec)

mysql>
mysql> DELETE FROM Students4
    -> WHERE StudentID = 3;
Query OK, 1 row affected (0.00 sec)

mysql>
mysql> SELECT * FROM Students4;
+-----------+-----------+----------+------+
| StudentID | FirstName | LastName | GPA  |
+-----------+-----------+----------+------+
|         1 | John      | Doe      | 3.95 |
|         2 | Jane      | Smith    | 3.80 |
+-----------+-----------+----------+------+
2 rows in set (0.00 sec)

mysql>
mysql> ROLLBACK TO before_delete;
Query OK, 0 rows affected (0.00 sec)

mysql>
mysql> SELECT * FROM Students4;
+-----------+-----------+----------+------+
| StudentID | FirstName | LastName | GPA  |
+-----------+-----------+----------+------+
|         1 | John      | Doe      | 3.95 |
|         2 | Jane      | Smith    | 3.80 |
|         3 | Tom       | Wilson   | 3.55 |
+-----------+-----------+----------+------+
3 rows in set (0.00 sec)

mysql>
mysql> COMMIT;
Query OK, 0 rows affected (0.00 sec)
```

- **DCL Commands:**

(1) GRANT: GRANT SELECT, UPDATE ON MY_TABLE TO SOME_USER, ANOTHER_USER;

(2) REVOKE: REVOKE SELECT, UPDATE ON MY_TABLE FROM USER1, USER2;

Conclusion: TCL is a scripting language used for controlling applications and systems, whereas DCL is a subset of SQL specifically designed for managing access to data within a database. Both TCL and DCL serve different purposes within the realm of computing, with TCL focusing on scripting and automation, while DCL manages data access control within databases.