"Heaven's Light is Our Guide"

Rajshahi University of Engineering & Technology, Rajshahi

Department of Electrical & Computer Engineering

Course Code : ECE 2216

Course Title : Database Systems Sessional

Experiment No. : 01

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Experiment Number: 01

Experiment Name: Database Management with MySQL: DDL and DML Operations

Objectives:

To create a database and table for student information, modify table structures, add and update columns, and delete records based on criteria.

Theory:

MySQL is a popular, open-source relational database management system (RDBMS) used to store, manage, and retrieve data. It uses SQL (Structured Query Language) to interact with databases. MySQL is widely adopted for web applications due to its reliability, efficiency, and ability to handle large datasets. Anybody dealing with databases must comprehend the distinction between DDL and DML commands because it impacts how data is saved, accessed, and modified.

Data Definition Language (DDL)

DDL commands are used to define and modify the structure of a database. They are essential for creating and managing databases and tables. Key DDL commands include:

- **CREATE:** Used to create new databases or tables.
- **ALTER:** Used to modify the structure of an existing table, such as adding or modifying columns.
- **RENAME:** Changes the name of a table or column.
- **DROP:** Deletes an entire table or database.
- **TRUNCATE:** Removes all data from a table but keeps the table structure.

Data Manipulation Language (DML)

DML commands manipulate the data within tables, such as adding, modifying, or deleting records. Key DML commands include:

- **INSERT:** Adds new data into a table.
- **UPDATE:** Modifies existing records in a table.
- **DELETE:** Removes specific records from a table based on a condition.
- **WHERE:** Filters records for SELECT, UPDATE, or DELETE operations.
- **MODIFY:** Alters the data type of a column.
- **SET:** Used in UPDATE statements to change values based on conditions.

Tables in MySQL are fundamental structures for storing data. Creating and manipulating tables involves defining their structure and managing the data they hold through various SQL commands.

Problem Statements:

1. Create a database and a table for storing student information.
2. Modify the table by changing a column's name and data type.
3. Add a new column to the table and set values based on conditions.
4. Delete records where student marks are below a specified threshold.

Software Used:

1. XAMPP

Problem 1: Create Database and Table

SQL Commands:

```sql
-- Create the database
CREATE DATABASE Student;

-- Use the created database
USE Student;

-- Create the table
CREATE TABLE Students (
    Roll INT,
    Name VARCHAR(50),
    Semester INT,
    Major VARCHAR(50),
    Obtained_Marks FLOAT
);

-- Insert records for at least 10 students with obtained marks within 75
INSERT INTO Students (Roll, Name, Semester, Major, Obtained_Marks) VALUES
(40, 'Nuha', 4, 'Computer Science', 65),
(41, 'Ribbie', 4, 'Computer Science', 23),
(42, 'Shad', 4, 'Computer Science', 15),
(43, 'Ripon', 4, 'Electrical Engineering', 45),
(44, 'Sadaf', 4, 'Computer Science', 30),
(45, 'Arif', 4, 'Computer Science', 67),
(46, 'Avi', 4, 'Electrical Engineering', 55),
(47, 'Saima', 4, 'Computer Science', 70),
(48, 'Emon', 4, 'Electrical Engineering', 25),
(49, 'Proma', 4, 'Computer Science', 65),
(50, 'Sazid', 4, 'Electrical Engineering', 50);
```

Output:

Roll	Name	Semester	Major	Obtained_Marks
40	Nuha	4	Computer Science	65
41	Ribbie	4	Computer Science	23
42	Shad	4	Computer Science	15
43	Ripon	4	Electrical Engineering	45
44	Sadaf	4	Computer Science	30
45	Arif	4	Computer Science	67
46	Avi	4	Electrical Engineering	55
47	Saima	4	Computer Science	70
48	Emon	4	Electrical Engineering	25
49	Proma	4	Computer Science	65
50	Sazid	4	Electrical Engineering	50

Figure 1: Database and table creation output

Problem 2: Change Column Name and Data Type

SQL Commands:

```
-- Rename 'Major' column to 'Fav_Subject'
ALTER TABLE Students CHANGE COLUMN Major Fav_Subject VARCHAR(50);

-- Change the data type of 'Obtained_Marks' from FLOAT to DOUBLE
ALTER TABLE Students MODIFY Obtained_Marks DOUBLE;
```

Output:

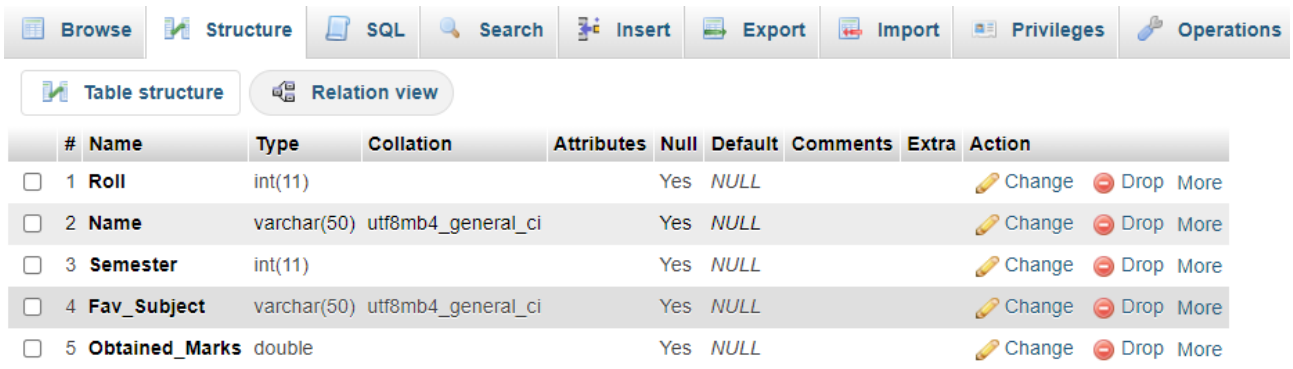

Figure 2: Column name and data type change output

Problem 3: Add a New Column and Set Values Based on Condition

SQL Commands:

```
-- Add a new column named 'Log'
ALTER TABLE Students ADD Log VARCHAR(20);

-- Update 'Log' column based on the condition that marks are below 30
UPDATE Students SET Log = 'Not Applicable' WHERE Obtained_Marks < 30;

-- Update 'Log' column for all other records
UPDATE Students SET Log = 'Applicable' WHERE Obtained_Marks >= 30;
```

Output:

Roll	Name	Semester	Fav_Subject	Obtained_Marks	Log
40	Nuha	4	Computer Science	65	Applicable
41	Ribbie	4	Computer Science	23	Not Applicable
42	Shad	4	Computer Science	15	Not Applicable
43	Ripon	4	Electrical Engineering	45	Applicable
44	Sadaf	4	Computer Science	30	Applicable
45	Arif	4	Computer Science	67	Applicable
46	Avi	4	Electrical Engineering	55	Applicable
47	Saima	4	Computer Science	70	Applicable
48	Emon	4	Electrical Engineering	25	Not Applicable
49	Proma	4	Computer Science	65	Applicable
50	Sazid	4	Electrical Engineering	50	Applicable

Figure 3: Output after adding and updating the 'Log' column

Problem 4: Delete Student Records Where Marks Are Below 30

SQL Commands:

```
-- Delete students whose marks are below 30
DELETE FROM Students WHERE Obtained_Marks < 30;
```

Output:

Roll	Name	Semester	Fav_Subject	Obtained_Marks	Log
40	Nuha	4	Computer Science	65	Applicable
43	Ripon	4	Electrical Engineering	45	Applicable
44	Sadaf	4	Computer Science	30	Applicable
45	Arif	4	Computer Science	67	Applicable
46	Avi	4	Electrical Engineering	55	Applicable
47	Saima	4	Computer Science	70	Applicable
49	Proma	4	Computer Science	65	Applicable
50	Sazid	4	Electrical Engineering	50	Applicable

Figure 4: Output after deleting records with marks below 30

Discussion:

This lab covered essential MySQL operations, including creating and modifying tables and managing data. We practiced renaming columns, altering data types, and updating records. If we want to remove all records from a table while keeping its structure, we would use TRUNCATE TABLE Students and to completely delete the table and all its data, we would use DROP TABLE Students. TRUNCATE is useful for quickly emptying a table, whereas DROP eliminates the table entirely.

References

[1] MySQL Documentation, *MySQL Reference Manual*, [Online]. Available: `https://dev.mysql.com/doc/`. Accessed: September 2024.

[2] W3Schools, *SQL Tutorial*, [Online]. Available: `https://www.w3schools.com/sql/sql_intro.asp`. Accessed: September 2024.