“Heaven’s Light is Our Guide

Rajshahi University of Engineering & Technology
Rajshahi, Bangladesh

Department of Electrical & Computer Engineering
(ECE-21)

Course Title: Database Systems Sessional

Lab Report No: 02

Course Code: ECE 2216

Date of Submission: 01/10/2024

Submitted To:	**Submitted By:**
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Lab Report No. 02

1. **Experiment Name:** Database query using MySQL.

2. **Theory:**

MySQL allows us to manage databases using SQL queries like `SELECT`, `INSERT`, `UPDATE`, and `DELETE` to retrieve, add, modify, and remove data. You can filter (`WHERE`), sort (`ORDER BY`), and group (`GROUP BY`) data, and join multiple tables with `JOIN` clauses. Advanced functions like subqueries and aggregates (`COUNT`, `SUM`, etc.) enable complex data analysis.

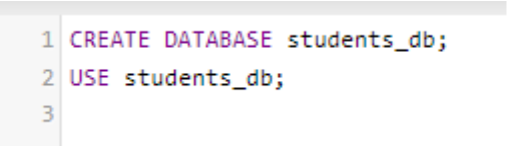
3. **Problem Statement:**

1. Find students who are older than 20 and have a GPA above the average GPA of all students
2. Find the top 5 students with the highest fees paid, ordered by GPA (in descending order)
as a tiebreaker
3. List students who belong to the "Engineering" department, have a GPA greater than 3.5,
and are enrolled after 2020
4. Find students who are not active (i.e., enrollment_status = 'inactive') and have not paid
any fees (fees_paid = 0)
5. Calculate the total fees paid and average GPA for each department, but only for departments with more than 10 students

4. **Software Used:**

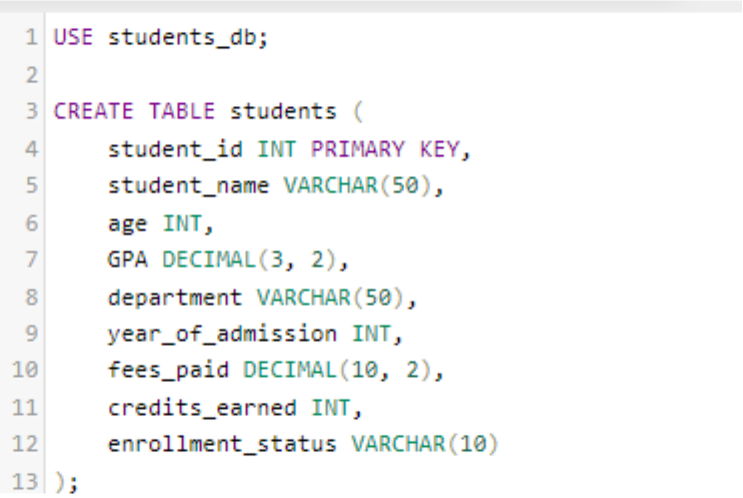
1. MySQL
2. Xampp

5. Database and the table



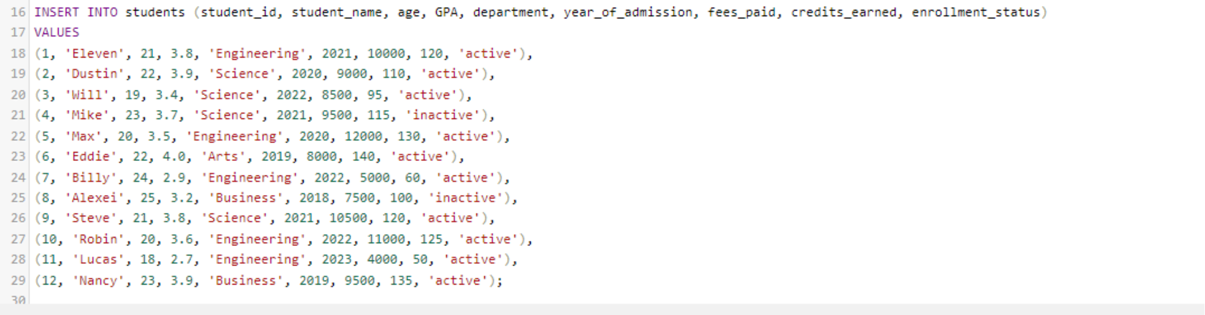
```sql
CREATE DATABASE students_db;
USE students_db;

```



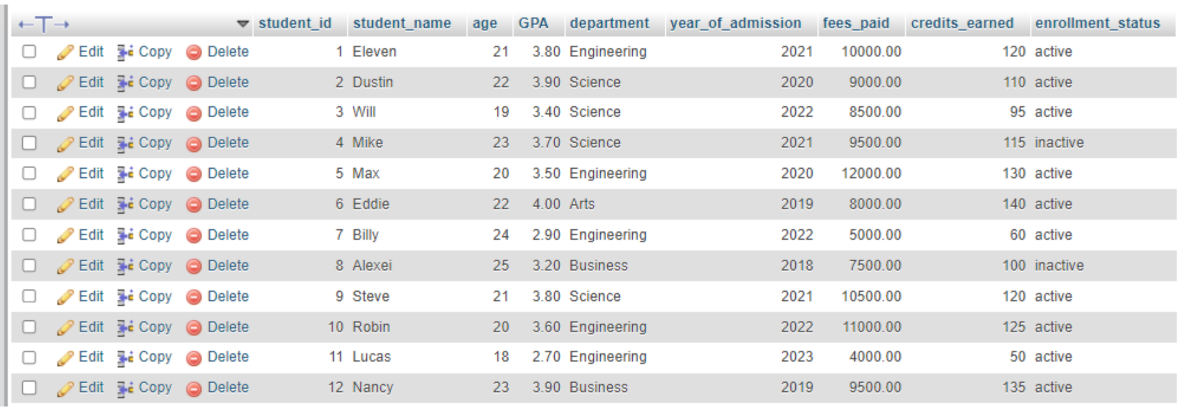
```sql
USE students_db;

CREATE TABLE students (
    student_id INT PRIMARY KEY,
    student_name VARCHAR(50),
    age INT,
    GPA DECIMAL(3, 2),
    department VARCHAR(50),
    year_of_admission INT,
    fees_paid DECIMAL(10, 2),
    credits_earned INT,
    enrollment_status VARCHAR(10)
);
```



```sql
INSERT INTO students (student_id, student_name, age, GPA, department, year_of_admission, fees_paid, credits_earned, enrollment_status)
VALUES
(1, 'Eleven', 21, 3.8, 'Engineering', 2021, 10000, 120, 'active'),
(2, 'Dustin', 22, 3.9, 'Science', 2020, 9000, 110, 'active'),
(3, 'Will', 19, 3.4, 'Science', 2022, 8500, 95, 'active'),
(4, 'Mike', 23, 3.7, 'Science', 2021, 9500, 115, 'inactive'),
(5, 'Max', 20, 3.5, 'Engineering', 2020, 12000, 130, 'active'),
(6, 'Eddie', 22, 4.0, 'Arts', 2019, 8000, 140, 'active'),
(7, 'Billy', 24, 2.9, 'Engineering', 2022, 5000, 60, 'active'),
(8, 'Alexei', 25, 3.2, 'Business', 2018, 7500, 100, 'inactive'),
(9, 'Steve', 21, 3.8, 'Science', 2021, 10500, 120, 'active'),
(10, 'Robin', 20, 3.6, 'Engineering', 2022, 11000, 125, 'active'),
(11, 'Lucas', 18, 2.7, 'Engineering', 2023, 4000, 50, 'active'),
(12, 'Nancy', 23, 3.9, 'Business', 2019, 9500, 135, 'active');
```

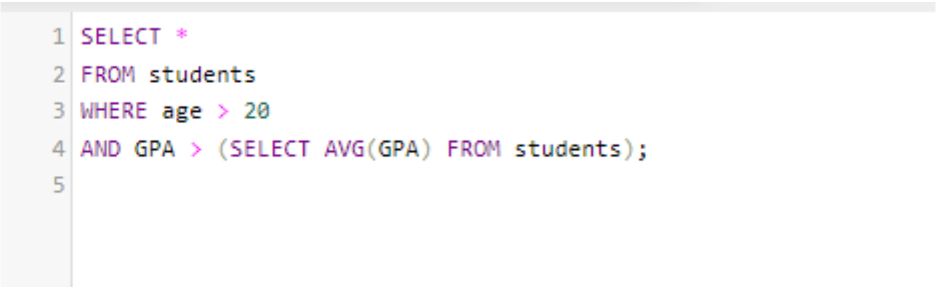
Output:



←T→				student_id	student_name	age	GPA	department	year_of_admission	fees_paid	credits_earned	enrollment_status
□	Edit	Copy	Delete	1	Eleven	21	3.80	Engineering	2021	10000.00	120	active
□	Edit	Copy	Delete	2	Dustin	22	3.90	Science	2020	9000.00	110	active
□	Edit	Copy	Delete	3	Will	19	3.40	Science	2022	8500.00	95	active
□	Edit	Copy	Delete	4	Mike	23	3.70	Science	2021	9500.00	115	inactive
□	Edit	Copy	Delete	5	Max	20	3.50	Engineering	2020	12000.00	130	active
□	Edit	Copy	Delete	6	Eddie	22	4.00	Arts	2019	8000.00	140	active
□	Edit	Copy	Delete	7	Billy	24	2.90	Engineering	2022	5000.00	60	active
□	Edit	Copy	Delete	8	Alexei	25	3.20	Business	2018	7500.00	100	inactive
□	Edit	Copy	Delete	9	Steve	21	3.80	Science	2021	10500.00	120	active
□	Edit	Copy	Delete	10	Robin	20	3.60	Engineering	2022	11000.00	125	active
□	Edit	Copy	Delete	11	Lucas	18	2.70	Engineering	2023	4000.00	50	active
□	Edit	Copy	Delete	12	Nancy	23	3.90	Business	2019	9500.00	135	active

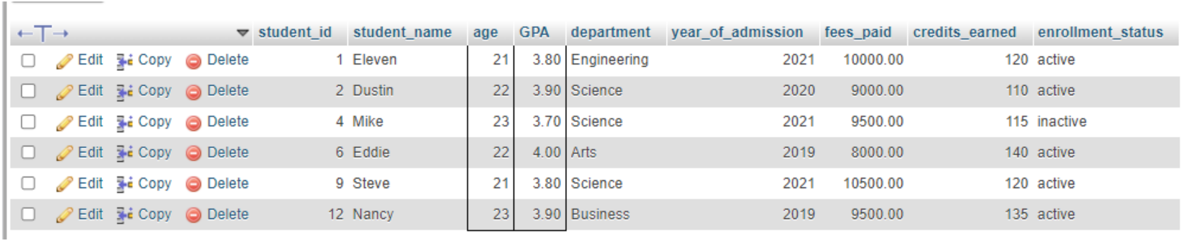
Task 1: Find students older than 20 with GPA above the average GPA of all students

Code:



```
SELECT *
FROM students
WHERE age > 20
AND GPA > (SELECT AVG(GPA) FROM students);
```

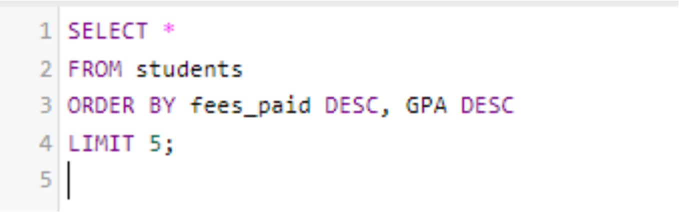
Output:



←T→				student_id	student_name	age	GPA	department	year_of_admission	fees_paid	credits_earned	enrollment_status
□	Edit	Copy	Delete	1	Eleven	21	3.80	Engineering	2021	10000.00	120	active
□	Edit	Copy	Delete	2	Dustin	22	3.90	Science	2020	9000.00	110	active
□	Edit	Copy	Delete	4	Mike	23	3.70	Science	2021	9500.00	115	inactive
□	Edit	Copy	Delete	6	Eddie	22	4.00	Arts	2019	8000.00	140	active
□	Edit	Copy	Delete	9	Steve	21	3.80	Science	2021	10500.00	120	active
□	Edit	Copy	Delete	12	Nancy	23	3.90	Business	2019	9500.00	135	active

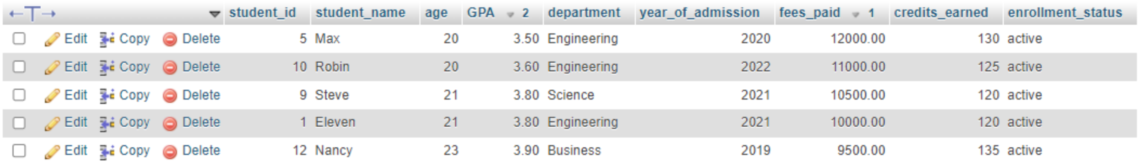
Task 2: Find the top 5 students with the highest fees paid, ordered by GPA (as a tiebreaker)

Code:



```sql
SELECT *
FROM students
ORDER BY fees_paid DESC, GPA DESC
LIMIT 5;
```

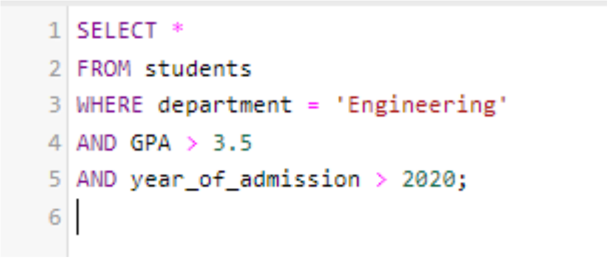
Output:



←T→	student_id	student_name	age	GPA ▾ 2	department	year_of_admission	fees_paid ▾ 1	credits_earned	enrollment_status
□ Edit Copy Delete	5	Max	20	3.50	Engineering	2020	12000.00	130	active
□ Edit Copy Delete	10	Robin	20	3.60	Engineering	2022	11000.00	125	active
□ Edit Copy Delete	9	Steve	21	3.80	Science	2021	10500.00	120	active
□ Edit Copy Delete	1	Eleven	21	3.80	Engineering	2021	10000.00	120	active
□ Edit Copy Delete	12	Nancy	23	3.90	Business	2019	9500.00	135	active

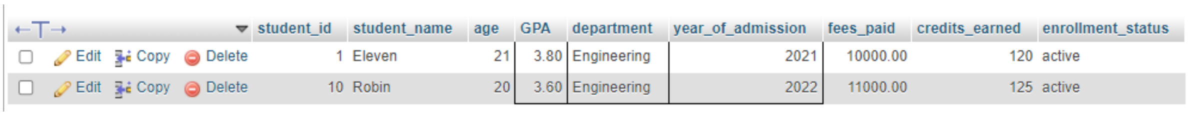
Task 3: List students from the "Engineering" department with a GPA greater than 3.5 and enrolled after 2020

Code:



```sql
SELECT *
FROM students
WHERE department = 'Engineering'
AND GPA > 3.5
AND year_of_admission > 2020;
```

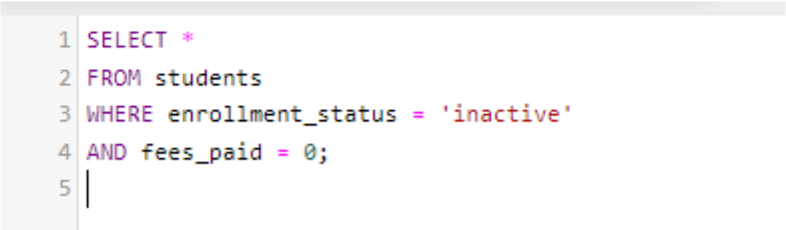
Output:



←T→	student_id	student_name	age	GPA	department	year_of_admission	fees_paid	credits_earned	enrollment_status
□ Edit Copy Delete	1	Eleven	21	3.80	Engineering	2021	10000.00	120	active
□ Edit Copy Delete	10	Robin	20	3.60	Engineering	2022	11000.00	125	active

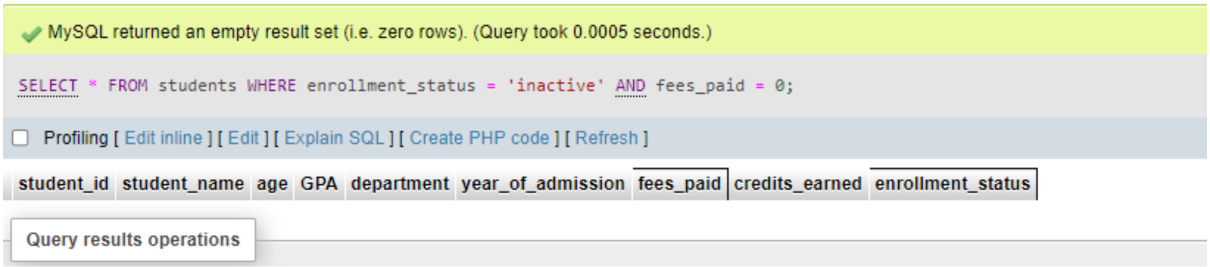
Task 4: Find students who are not active and have not paid any fees (fees_paid = 0)

Code:



```sql
SELECT *
FROM students
WHERE enrollment_status = 'inactive'
AND fees_paid = 0;
```

Output:



✓ MySQL returned an empty result set (i.e. zero rows). (Query took 0.0005 seconds.)

```sql
SELECT * FROM students WHERE enrollment_status = 'inactive' AND fees_paid = 0;
```

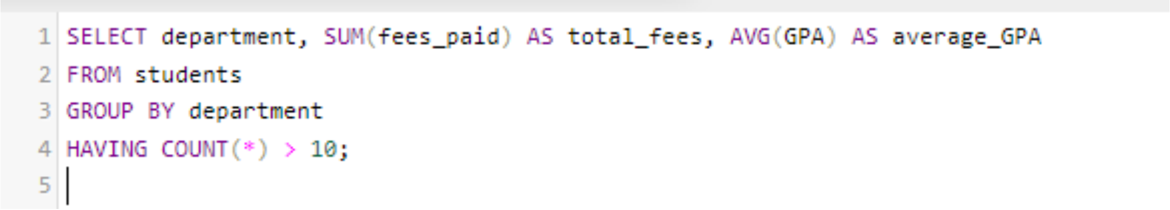
□ Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh]

student_id	student_name	age	GPA	department	year_of_admission	fees_paid	credits_earned	enrollment_status

Query results operations

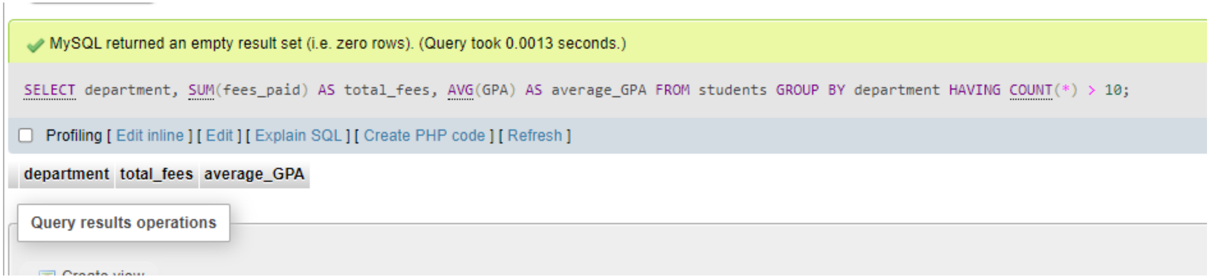
Task 5: Calculate the total fees paid and average GPA for each department with more than 10 students

Code:



```sql
SELECT department, SUM(fees_paid) AS total_fees, AVG(GPA) AS average_GPA
FROM students
GROUP BY department
HAVING COUNT(*) > 10;
```

Output:



✓ MySQL returned an empty result set (i.e. zero rows). (Query took 0.0013 seconds.)

```sql
SELECT department, SUM(fees_paid) AS total_fees, AVG(GPA) AS average_GPA FROM students GROUP BY department HAVING COUNT(*) > 10;
```

□ Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh]

department	total_fees	average_GPA

Query results operations

Create view

6. Discussion:

MySQL querying is essential for managing and retrieving data in relational databases. Operations like `SELECT`, `INSERT`, `UPDATE`, and `DELETE` allow efficient data manipulation, while filtering (`WHERE`), sorting (`ORDER BY`), and joins enable precise data access across multiple tables. Grouping (`GROUP BY`) and aggregate functions (`COUNT`, `SUM`, etc.) are useful for data analysis, and subqueries enhance query flexibility for complex operations. Mastering these features optimizes database performance and ensures efficient data handling.

7. References:

1. MySQL, "MySQL 8.0 Reference Manual," MySQL Documentation, [Online]. Available: https://dev.mysql.com/doc/. [Accessed: 01-Oct-2024].

2.W3Schools,"MySQLTutorial,"W3Schools,[Online].Available: https://www.w3schools.com/sql/. [Accessed: 01-Oct-2024].

3. SQLZoo, "SQL Tutorial," SQLZoo, [Online]. Available: https://sqlzoo.net/. [Accessed: 01-Oct-2024].

4.GeeksforGeeks,"MySQL-Overview,"GeeksforGeeks,[Online].Available: https://www.geeksforgeeks.org/mysql/. [Accessed: 01-Oct-2024].