EXPERIMENT 1

Create a table with constraints

1. **NOT NULL Constraint:** NOT NULL ensures that no NULL values are allowed in the columns.
2. **UNIQUE Constraint:** UNIQUE ensures all values in columns are different (no duplicates allowed).
3. **PRIMARY KEY Constraint:** PRIMARY KEY uniquely identifies each row and implies NOT NULL + UNIQUE.
4. **FOREIGN KEY Constraint:** A **FOREIGN KEY** is a column (or set of columns) in one table that references the primary key in another table to enforce referential integrity.
5. **CHECK Constraint:** CHECK enforces logical rules (e.g., quantity must be between 1 and 999).
6. **DEFAULT Constraint:** DEFAULT automatically sets a value if none is given (e.g., today's date).
7. **CREATE INDEX Constraint:** INDEX improves query performance on large tables, especially for searching/sorting.

Source code:

```
CREATE TABLE departments (
   dept_id INT PRIMARY KEY,
   dept_name VARCHAR(100) UNIQUE NOT NULL);
```

Source code:

```
CREATE TABLE employees (
   emp_id INT PRIMARY KEY,
   first_name VARCHAR(50) NOT NULL,
   last_name VARCHAR(50) NOT NULL,
   email VARCHAR(100) UNIQUE NOT NULL,
   hire_date DATE DEFAULT CURRENT_DATE,
   salary DECIMAL(10,2) CHECK (salary >= 30000),
   dept_id INT, CONSTRAINT fk_department FOREIGN KEY (dept_id)
      REFERENCES departments(dept_id));
```

Source code:

```
CREATE INDEX idx_lastname ON employees(last_name);
```

EXPERIMENT 2

Implementation of SQL Commands

1. **Insert values with a single entry**: Adds one row of data into a table using the INSERT INTO statement.
2. **Insert values with multiple entries**: Adds multiple rows at once using a single INSERT INTO statement with multiple value sets.
3. **ALTER Table Structure**: Modifies the structure of an existing table, such as adding or removing columns.
4. **VIEW Table structure**: Displays the schema of a table using commands like DESCRIBE or SHOW COLUMNS.
5. **UPDATE table**: Changes existing data in one or more rows using the UPDATE statement with a WHERE clause.
6. **DELETE Rows in table**: Removes specific rows from a table using the DELETE FROM statement with a WHERE clause.
7. **DROP table**: Permanently deletes an entire table and all its data from the database.

Source code:

```
CREATE TABLE products (
   product_id INT PRIMARY KEY,
   product_name VARCHAR(100) NOT NULL,
   price DECIMAL(10, 2) NOT NULL,
   quantity INT NOT NULL);
INSERT INTO products (product_id, product_name, price, quantity)
VALUES (101, 'Wireless Mouse', 25.99, 100);
INSERT INTO products (product_id, product_name, price, quantity) VALUES
(102, 'USB Keyboard', 19.99, 150);
INSERT INTO products (product_id, product_name, price, quantity) VALUES
(103, 'HDMI Cable', 9.99, 200);
INSERT INTO products (product_id, product_name, price, quantity) VALUES
(104, 'Laptop Stand', 34.50, 75);
INSERT ALL
   INTO products (product_id, product_name, price, quantity) VALUES (201,
'Gaming Mouse', 45.99, 80)
   INTO products (product_id, product_name, price, quantity) VALUES (202,
'Mechanical Keyboard', 89.99, 60)
   INTO products (product_id, product_name, price, quantity) VALUES (203,
'Webcam HD', 59.49, 120)
SELECT * FROM dual;
```

Source code:

```
ALTER TABLE products
```

```
ADD category VARCHAR2(50);
```

Source code:

```
ALTER TABLE products
REBNAME COLUMN quantity TO  stock_available;
```

Source code:

```
ALTER TABLE products
DROP COLUMN CATEGORY;
```

Source code:

```
CREATE VIEW product_summary AS
SELECT products_id,product_name,price
FROM products
WHERE price > 50;
```

Source code:

```
UPDATE products
SET price=100
WHERE product_id=101;
```

Source code:

```
DELETE FROM products
WHERE products_id=103;
```

Source code:

```
DROP TABLE products;
```

EXPERIMENT 3

Aggregate Function

1. **MIN()**: Returns the smallest value in a column.
2. **MAX()**: Returns the largest value in a column.
3. **COUNT()**: Returns the number of rows that match a specified condition.
4. **SUM()**: Calculates the total sum of a numeric column.
5. **AVG()**: Computes the average value of a numeric column.

SourceCode:

```
 CREATE TABLE fruits (
      product_id INT PRIMARY KEY,
    product_name VARCHAR2(100) NOT NULL,
    price NUMBER(10,2) NOT NULL,
    quantity INT NOT NULL);
INSERT INTO fruits (product_id, product_name, price, quantity) VALUES (101,
'Apple', 0.99, 100);
INSERT INTO fruits (product_id, product_name, price, quantity) VALUES (102,
'Banana', 0.59, 150);
INSERT INTO fruits (product_id, product_name, price, quantity) VALUES (103,
'Orange', 1.25, 200);
INSERT INTO fruits (product_id, product_name, price, quantity) VALUES (104,
'Mango', 2.50, 75);
INSERT INTO fruits (product_id, product_name, price, quantity) VALUES (201,
'Grapes', 3.00, 80);
INSERT INTO fruits (product_id, product_name, price, quantity) VALUES (202,
'Pineapple', 2.99, 60);
INSERT INTO fruits (product_id, product_name, price, quantity) VALUES (203,
'Watermelon', 5.49, 120);
SELECT COUNT(*) AS total_fruits
FROM fruits;
```

SourceCode:

```
SELECT SUM(quantity) AS total_quantity
FROM fruits;
```

SourceCode:

```
SELECT AVG(price) AS avg_price
FROM fruits;
```

SourceCode:

```
SELECT MAX(price) AS max_price,
MIN(price) AS min_price
FROM fruits;
```

EXPERIMENT 4

1. **GROUP BY**: Organizes rows into groups based on one or more columns, often used with aggregate functions.
2. **ORDER BY**: Sorts the result set of a query by one or more columns in ascending (ASC) or descending (DESC) order.

Source code:

```
CREATE TABLE sales (
   sale_id INT PRIMARY KEY,
   product_name VARCHAR2(100) NOT NULL,
   category VARCHAR2(50),
   quantity_sold INT NOT NULL,
   sale_amount NUMBER(10,2) NOT NULL);
INSERT INTO sales (sale_id, product_name, category, quantity_sold,
sale_amount) VALUES (1, 'Apple', 'Fruit', 50, 49.50);
INSERT INTO sales (sale_id, product_name, category, quantity_sold,
sale_amount) VALUES (2, 'Banana', 'Fruit', 30, 17.70);
INSERT INTO sales (sale_id, product_name, category, quantity_sold,
sale_amount) VALUES (3, 'Orange', 'Fruit', 40, 50.00);
INSERT INTO sales (sale_id, product_name, category, quantity_sold,
sale_amount) VALUES (4, 'Mango', 'Fruit', 20, 50.00);
INSERT INTO sales (sale_id, product_name, category, quantity_sold,
sale_amount) VALUES (5, 'Soap', 'Grocery', 15, 45.00);
INSERT INTO sales (sale_id, product_name, category, quantity_sold,
sale_amount) VALUES (6, 'Shampoo', 'Grocery', 10, 60.00);
INSERT INTO sales (sale_id, product_name, category, quantity_sold,
sale_amount) VALUES (7, 'Notebook', 'Stationery', 25, 75.00);
INSERT INTO sales (sale_id, product_name, category, quantity_sold,
sale_amount) VALUES (8, 'Pen', 'Stationery', 50, 25.00);
```

Source code:

```
SELECT category, SUM(quantity_sold) AS total_quantity, SUM(sale_amount) AS
total_sales
FROM sales GROUP BY category;
```

Source code:

```
SELECT product_name, category, quantity_sold, sale_amount
FROM sales
ORDER BY sale_amount DESC;
```

Source code:

```
SELECT product_name, category, quantity_sold, sale_amount
FROM sales
ORDER BY category ASC, sale_amount DESC;
```

Source code:

```
SELECT category, SUM(quantity_sold) AS total_quantity, SUM(sale_amount) AS total_sales
FROM sales
GROUP BY category
ORDER BY total_sales DESC;
```

EXPERIMENT 5

1. **Ascending: ASC** sorts query results from lowest to highest.
2. **Descending: DESC** sorts from highest to lowest based on the specified column.

Source code:

```
CREATE TABLE planets (
   planet_id INT PRIMARY KEY,
   planet_name VARCHAR2(50) NOT NULL,
   distance_from_sun NUMBER(10,2),
   diameter NUMBER(10,2));
INSERT INTO planets (planet_id, planet_name, distance_from_sun, diameter)
VALUES (1, 'Mercury', 57.9, 4879);
INSERT INTO planets (planet_id, planet_name, distance_from_sun, diameter)
VALUES (2, 'Venus', 108.2, 12104);
INSERT INTO planets (planet_id, planet_name, distance_from_sun, diameter)
VALUES (3, 'Earth', 149.6, 12756);
INSERT INTO planets (planet_id, planet_name, distance_from_sun, diameter)
VALUES (4, 'Mars', 227.9, 6792);
INSERT INTO planets (planet_id, planet_name, distance_from_sun, diameter)
VALUES (5, 'Jupiter', 778.3, 142984);
INSERT INTO planets (planet_id, planet_name, distance_from_sun, diameter)
VALUES (6, 'Saturn', 1427.0, 120536);
INSERT INTO planets (planet_id, planet_name, distance_from_sun, diameter)
VALUES (7, 'Uranus', 2871.0, 51118);
INSERT INTO planets (planet_id, planet_name, distance_from_sun, diameter)
VALUES (8, 'Neptune', 4497.1, 49528);
```

Source code:

```
Select * from planets;
SELECT planet_name, distance_from_sun, diameter
FROM planets
ORDER BY distance_from_sun ASC;
```

Source code:

```
SELECT planet_name, distance_from_sun, diameter
FROM planets
ORDER BY diameter DESC;
```

EXPERIMENT 6

SQL Operators

1. **LIKE**: Filters results based on pattern matching using % (any characters) and _ (single character).
2. **BETWEEN**: Checks if a value lies within a specified inclusive range.
3. **OR**: Returns results if **any** of the given conditions are true.

Source code:

```
CREATE TABLE Suppliers(SupplierID INT PRIMARY KEY,SupplierName
VARCHAR(100) NOT NULL,City VARCHAR(50));
CREATE SEQUENCE Suppliers_seq START WITH 1 INCREMENT BY 1;
CREATE OR REPLACE TRIGGER Suppliers_on_insert
BEFORE INSERT ON Suppliers
FOR EACH ROW
BEGIN
  SELECT Suppliers_seq.nextval
  INTO :new.SupplierID
  FROM dual;
END;
CREATE TABLE Products (ProductID INT PRIMARY KEY,ProductName
VARCHAR(100) NOT NULL,Category VARCHAR(50),Price NUMBER(10,
2),StockQuantity INT,SupplierID INT,FOREIGN KEY(SupplierID) REFERENCES
Suppliers(SupplierID));
CREATE SEQUENCE Products_seq
START WITH 1
INCREMENT BY 1;
CREATE OR REPLACE TRIGGER Products_on_insert
BEFORE INSERT ON Products
FOR EACH ROW
BEGIN
  SELECT Products_seq.nextval
  INTO :new.ProductID
  FROM dual;
END;
INSERT INTO Suppliers (SupplierName, City) VALUES ('ToolMaster Pro', 'New
York');
```

```
INSERT INTO Suppliers (SupplierName, City) VALUES ('Eastern Lumber Co.',
'Boston');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Quick Fasteners Ltd.',
'Miami');
INSERT INTO Suppliers (SupplierName, City) VALUES ('PowerHouse Electric',
'Chicago');
INSERT INTO Suppliers (SupplierName, City) VALUES ('The Metal Works',
'Seattle');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Apex Safety Gear',
'Dallas');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Prime Plumbing
Supply', 'Phoenix');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Global Adhesives',
'Denver');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Brick & Mortar Co.',
'Atlanta');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Precision Measuring',
'Houston');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Super Wrench Group',
'New York');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Cedar Creek Wood',
'Boston');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Volta Electrical',
'Miami');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Ironclad Hardware',
'Chicago');
INSERT INTO Suppliers (SupplierName, City) VALUES ('AquaFlow Plumbing',
'Seattle');
INSERT INTO Suppliers (SupplierName, City) VALUES ('SureGrip Fasteners',
'Dallas');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Bright Light Solutions',
'Phoenix');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Durable Paint Co.',
'Denver');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Contractor Essentials',
'Atlanta');
INSERT INTO Suppliers (SupplierName, City) VALUES ('Home Fix Depot',
'Houston');
INSERT INTO Products (ProductName, Category, Price, StockQuantity,
SupplierID) VALUES ('Hammer Pro Titanium', 'Tool', 39.99, 150, 1);
INSERT INTO Products (ProductName, Category, Price, StockQuantity,
SupplierID) VALUES ('1/4 inch Hex Bolts', 'Fastener', 5.25, 500, 3);
```

```
INSERT INTO Products (ProductName, Category, Price, StockQuantity,
SupplierID) VALUES ('LED Flood Light', 'Electrical', 48.50, 120, 4);
INSERT INTO Products (ProductName, Category, Price, StockQuantity,
SupplierID) VALUES ('Red Cedar 4x4 Post', 'Wood', 18.75, 80, 12);
INSERT INTO Products (ProductName, Category, Price, StockQuantity,
SupplierID) VALUES ('Adjustable Wrench 12"', 'Tool', 22.00, 120, 11);
INSERT INTO Products (ProductName, Category, Price, StockQuantity,
SupplierID) VALUES ('Hex Head Screws Zinc', 'Fastener', 6.00, 450, 16);
INSERT INTO Products (ProductName, Category, Price, StockQuantity,
SupplierID) VALUES ('Copper Wire Spool 12g', 'Electrical', 75.99, 100, 13);
INSERT INTO Products (ProductName, Category, Price, StockQuantity,
SupplierID) VALUES ('Oak Plywood 3/4"', 'Wood', 65.00, 50, 12);
INSERT INTO Products (ProductName, Category, Price, StockQuantity,
SupplierID) VALUES ('Drill Bit Set (50pcs)', 'Tool', 59.99, 80, 1);
INSERT INTO Products (ProductName, Category, Price, StockQuantity,
SupplierID) VALUES ('Masonry Nails (Bulk)', 'Fastener', 12.50, 600, 3);
INSERT INTO Products (ProductName, Category, Price, StockQuantity,
SupplierID) VALUES ('White Outlet Cover', 'Electrical', 2.99, 750, 13);
INSERT INTO Products (ProductName, Category, Price, StockQuantity,
SupplierID) VALUES ('Pressure Treated Pine', 'Wood', 6.80, 200, 5);
INSERT INTO Products (ProductName, Category, Price, StockQuantity,
SupplierID) VALUES ('Safety Goggles Anti-Fog', 'Safety', 10.99, 250, 6);
INSERT INTO Products (ProductName, Category, Price, StockQuantity,
SupplierID) VALUES ('Aluminum Sheet Metal', 'Metal', 88.00, 40, 5);
INSERT INTO Products (ProductName, Category, Price, StockQuantity,
SupplierID) VALUES ('Magnetic Screwdriver Set', 'Tool', 14.50, 180, 11);
INSERT INTO Products (ProductName, Category, Price, StockQuantity,
SupplierID) VALUES ('Teflon Tape 1/2"', 'Plumbing', 1.99, 900, 7);
INSERT INTO Products (ProductName, Category, Price, StockQuantity,
SupplierID) VALUES ('PVC Pipe Connector 1"', 'Plumbing', 4.50, 320, 15);
INSERT INTO Products (ProductName, Category, Price, StockQuantity,
SupplierID) VALUES ('Heavy Duty Glue Stick', 'Adhesive', 3.75, 400, 8);
INSERT INTO Products (ProductName, Category, Price, StockQuantity,
SupplierID) VALUES ('Laser Measure Pro 60m', 'Measuring', 120.00, 30, 10);
INSERT INTO Products (ProductName, Category, Price, StockQuantity,
SupplierID) VALUES ('Galvanized Steel Pipe', 'Plumbing', 55.00, 60, 15);
SELECT ProductName, Price, Category FROM Products WHERE ProductName
LIKE '%Pro%';
SELECT ProductName, Price FROM Products WHERE Price BETWEEN 10.00
AND 50.00;
SELECT SupplierName, City FROM Suppliers WHERE City = 'New York' OR City
= 'Chicago';
```

EXPERIMENT 7

SQL Joins

1. **INNER JOIN**: Returns rows with matching values in both tables.
2. **LEFT JOIN**: Returns all rows from the left table and matched rows from the right.
3. **RIGHT JOIN**: Returns all rows from the right table and matched rows from the left.
4. **OUTER JOIN**: Returns all rows when there is a match in one of the tables.
5. **LEFT JOIN excluding INNER JOIN**: Returns unmatched rows from the left table only.
6. **RIGHT JOIN excluding INNER JOIN**: Returns unmatched rows from the right table only.
7. **OUTER JOIN excluding INNER JOIN**: Returns unmatched rows from both tables.

Source code:

```
SELECT P.ProductName, S.SupplierName FROM Products P INNER JOIN
Suppliers S ON P.SupplierID = S.SupplierID;
```

Source code:

```
SELECT P.ProductName, S.SupplierName FROM Products P LEFT JOIN
Suppliers S ON P.SupplierID = S.SupplierID;
```

Source code:

```
SELECT P.ProductName, S.SupplierName, S.City FROM Products P RIGHT
JOIN Suppliers S ON P.SupplierID = S.SupplierID;
```

Source code:

```
SELECT P.ProductName, S.SupplierName, S.City FROM Products P LEFT JOIN
Suppliers S ON P.SupplierID = S.SupplierID UNION ALL SELECT
P.ProductName, S.SupplierName, S.City FROM Products P RIGHT JOIN
Suppliers S ON P.SupplierID = S.SupplierID WHERE P.SupplierID IS NULL;
```

Source code:

```
SELECT P.ProductName, S.SupplierName FROM Products P LEFT JOIN
Suppliers S ON P.SupplierID = S.SupplierID WHERE S.SupplierID IS NULL;
SELECT S.SupplierName, S.City, P.ProductName FROM Products P RIGHT
JOIN Suppliers S ON P.SupplierID = S.SupplierID WHERE P.SupplierID IS
NULL;
```

Source code:

```
SELECT P.ProductName, S.SupplierName, S.City FROM Products P LEFT JOIN
Suppliers S ON P.SupplierID = S.SupplierID WHERE S.SupplierID IS NULL
UNION ALL SELECT P.ProductName, S.SupplierName, S.City FROM Products P
RIGHT JOIN Suppliers S ON P.SupplierID = S.SupplierID WHERE P.SupplierID
IS NULL;
```

EXPERIMENT 8

Normal Forms

1. **1NF (First Normal Form)**: Eliminates repeating groups; ensures atomic values in each column.
2. **2NF (Second Normal Form)**: Removes partial dependencies; every non-key attribute fully depends on the primary key.
3. **3NF:** Non-key columns depend only on the whole primary key — not on other non-key columns.

Source code:1NF

```
CREATE TABLE student_1nf (
  student_id INT,
  student_name VARCHAR(50),
  subject VARCHAR(50));
INSERT INTO student_1nf VALUES (1, 'Alice', 'Math');
INSERT INTO student_1nf VALUES (1, 'Alice', 'Science');
INSERT INTO student_1nf VALUES (2, 'Bob', 'English');
INSERT INTO student_1nf VALUES (2, 'Bob', 'History');
SELECT * FROM student_1nf;
```

Source code:2NF:

```
CREATE TABLE Students2 (
   student_id INT PRIMARY KEY,
   student_name VARCHAR2(50));
CREATE TABLE Courses2 (
   course_id INT PRIMARY KEY,
   course_name VARCHAR2(50),
   instructor_name VARCHAR2(50));
CREATE TABLE Enrollments2 (
   student_id INT,
   course_id INT,
   PRIMARY KEY (student_id, course_id),
   FOREIGN KEY (student_id) REFERENCES Students2(student_id),
   FOREIGN KEY (course_id) REFERENCES Courses2(course_id));
INSERT INTO Students2 VALUES (1, 'Alice');
INSERT INTO Students2 VALUES (2, 'Bob');
INSERT INTO Students2 VALUES (3, 'Charlie');
INSERT INTO Courses2 VALUES (101, 'Database Systems', 'Dr. Smith');
INSERT INTO Courses2 VALUES (102, 'Operating Systems', 'Prof. Brown');
INSERT INTO Courses2 VALUES (103, 'Networks', 'Dr. Green');
INSERT INTO Enrollments2 VALUES (1, 101);
INSERT INTO Enrollments2 VALUES (1, 102);
INSERT INTO Enrollments2 VALUES (2, 103);
INSERT INTO Enrollments2 VALUES (3, 101);
COMMIT;
SELECT
   s.student_id,
   s.student_name,
   c.course_id,
   c.course_name,
   c.instructor_name
FROM Enrollments2 e
JOIN Students2 s ON e.student_id = s.student_id
JOIN Courses2 c ON e.course_id = c.course_id
ORDER BY s.student_id, c.course_id;
```

Source code: 3NF

```
CREATE TABLE Students3 (
   student_id INT PRIMARY KEY,
   student_name VARCHAR2(50));
CREATE TABLE Instructors3 (
   instructor_id INT PRIMARY KEY,
   instructor_name VARCHAR2(50));
CREATE TABLE Courses3 (
   course_id INT PRIMARY KEY,
   course_name VARCHAR2(50),
   instructor_id INT,
   FOREIGN KEY (instructor_id) REFERENCES Instructors3(instructor_id));
CREATE TABLE Enrollments3 (
   student_id INT,
   course_id INT,
   PRIMARY KEY (student_id, course_id),
   FOREIGN KEY (student_id) REFERENCES Students3(student_id),
   FOREIGN KEY (course_id) REFERENCES Courses3(course_id));
INSERT INTO Students3 VALUES (1, 'Alice');
INSERT INTO Students3 VALUES (2, 'Bob');
INSERT INTO Students3 VALUES (3, 'Charlie');
INSERT INTO Instructors3 VALUES (201, 'Dr. Smith');
INSERT INTO Instructors3 VALUES (202, 'Prof. Brown');
INSERT INTO Instructors3 VALUES (203, 'Dr. Green');
INSERT INTO Courses3 VALUES (101, 'Database Systems', 201);
INSERT INTO Courses3 VALUES (102, 'Operating Systems', 202);
INSERT INTO Courses3 VALUES (103, 'Networks', 203);
INSERT INTO Enrollments3 VALUES (1, 101);
INSERT INTO Enrollments3 VALUES (1, 102);
INSERT INTO Enrollments3 VALUES (2, 103);
INSERT INTO Enrollments3 VALUES (3, 101);
COMMIT;
SELECT
   s.student_id,
   s.student_name,
   c.course_id,
   c.course_name,
   i.instructor_name
FROM Enrollments3 e
JOIN Students3 s ON e.student_id = s.student_id
JOIN Courses3 c ON e.course_id = c.course_id
JOIN Instructors3 i ON c.instructor_id = i.instructor_id
```

```
ORDER BY s.student_id, c.course_id;
```

EXPERIMENT 9

Nested Queries: A query within another SQL query, used to perform intermediate filtering or calculations.

Source code:

```
CREATE TABLE department ( dept_id INT PRIMARY KEY, dept_name
VARCHAR(50));
CREATE SEQUENCE dept_seq START WITH 1 INCREMENT BY 1;
CREATE OR REPLACE TRIGGER dept_on_insert
BEFORE INSERT ON department
FOR EACH ROW
 BEGIN
SELECT dept_seq.nextval INTO :new.dept_id FROM dual;
 END;
CREATE TABLE employee (emp_id INT PRIMARY KEY,emp_name
VARCHAR(50),salary NUMBER(10,2), dept_id INT, FOREIGN KEY (dept_id)
REFERENCES department(dept_id));
CREATE SEQUENCE emp_seq START WITH 1 INCREMENT BY 1;
CREATE OR REPLACE TRIGGER emp_on_insert
BEFORE INSERT ON employee
FOR EACH ROW
BEGIN
   SELECT emp_seq.nextval INTO :new.emp_id FROM dual;
END;
INSERT INTO employee (emp_name, salary, dept_id) VALUES ('Alice', 50000,
(SELECT dept_id FROM department WHERE dept_name = 'HR'));
INSERT INTO employee (emp_name, salary, dept_id) VALUES ('Bob', 60000,
(SELECT dept_id FROM department WHERE dept_name = 'HR'));
INSERT INTO employee (emp_name, salary, dept_id) VALUES ('Charlie', 55000,
(SELECT dept_id FROM department WHERE dept_name = 'HR'));
INSERT INTO employee (emp_name, salary, dept_id) VALUES ('David', 80000,
(SELECT dept_id FROM department WHERE dept_name = 'IT'));
INSERT INTO employee (emp_name, salary, dept_id) VALUES ('Eve', 90000,
(SELECT dept_id FROM department WHERE dept_name = 'IT'));
INSERT INTO employee (emp_name, salary, dept_id) VALUES ('Frank', 85000,
(SELECT dept_id FROM department WHERE dept_name = 'IT'));
INSERT INTO employee (emp_name, salary, dept_id) VALUES ('Grace', 70000,
(SELECT dept_id FROM department WHERE dept_name = 'Finance'));
```

```
INSERT INTO employee (emp_name, salary, dept_id) VALUES ('Hannah',
75000, (SELECT dept_id FROM department WHERE dept_name = 'Finance'));
INSERT INTO employee (emp_name, salary, dept_id) VALUES ('Irene', 45000,
(SELECT dept_id FROM department WHERE dept_name = 'HR'));
INSERT INTO employee (emp_name, salary, dept_id) VALUES ('Jack', 100000,
(SELECT dept_id FROM department WHERE dept_name = 'IT'));
INSERT INTO employee (emp_name, salary, dept_id) VALUES ('Kelly', 68000,
(SELECT dept_id FROM department WHERE dept_name = 'Finance'));
INSERT INTO employee (emp_name, salary, dept_id) VALUES ('Liam', 62000,
(SELECT dept_id FROM department WHERE dept_name = 'HR'));
INSERT INTO employee (emp_name, salary, dept_id) VALUES ('Mia', 95000,
(SELECT dept_id FROM department WHERE dept_name = 'IT'));
COMMIT;
SELECT emp_name, salary, dept_id
FROM employee
WHERE salary > ALL (
   SELECT salary
   FROM employee e_hr
   WHERE e_hr.dept_id = (
      SELECT dept_id FROM department WHERE dept_name = 'HR'));
SELECT emp_name, salary
FROM employee
WHERE dept_id NOT IN (
   SELECT dept_id
   FROM department
   WHERE dept_name = 'IT');
SELECT e.emp_name, e.salary, d_avg.Finance_Avg_Salary
FROM employee e
CROSS JOIN (
   SELECT AVG(salary) AS Finance_Avg_Salary
   FROM employee
   WHERE dept_id = (SELECT dept_id FROM department WHERE dept_name
= 'Finance')) d_avg;
```

EXPERIMENT 10

SQL WILD CARD CHARACTERS

1. **%**: Represents **zero or more characters** in a string.
2. **_**: Represents **exactly one character**.

Source code:

```
CREATE TABLE Employees_WC (
    emp_id INT PRIMARY KEY,
    emp_name VARCHAR2(50),
    department VARCHAR2(50));
INSERT INTO Employees_WC VALUES (1, 'Alice Johnson', 'HR');
INSERT INTO Employees_WC VALUES (2, 'Bob Smith', 'Finance');
INSERT INTO Employees_WC VALUES (3, 'Charlie Brown', 'IT');
INSERT INTO Employees_WC VALUES (4, 'Alicia Keys', 'HR');
INSERT INTO Employees_WC VALUES (5, 'Albert King', 'Sales');
INSERT INTO Employees_WC VALUES (6, 'Bobby Ray', 'Finance');
COMMIT;
SELECT * FROM Employees_WC
WHERE emp_name LIKE 'Al%';
SELECT * FROM Employees_WC
WHERE emp_name LIKE '%son';
SELECT * FROM Employees_WC
WHERE emp_name LIKE '%ob%';
SELECT * FROM Employees_WC
WHERE emp_name LIKE '_l%';
SELECT * FROM Employees_WC
WHERE department LIKE 'F%';
```

EXPERIMENT 11

SELECT with Comparison Operator: Retrieves rows that meet specific conditions using operators like =, >, <, >=, <=, <>.

Source code:

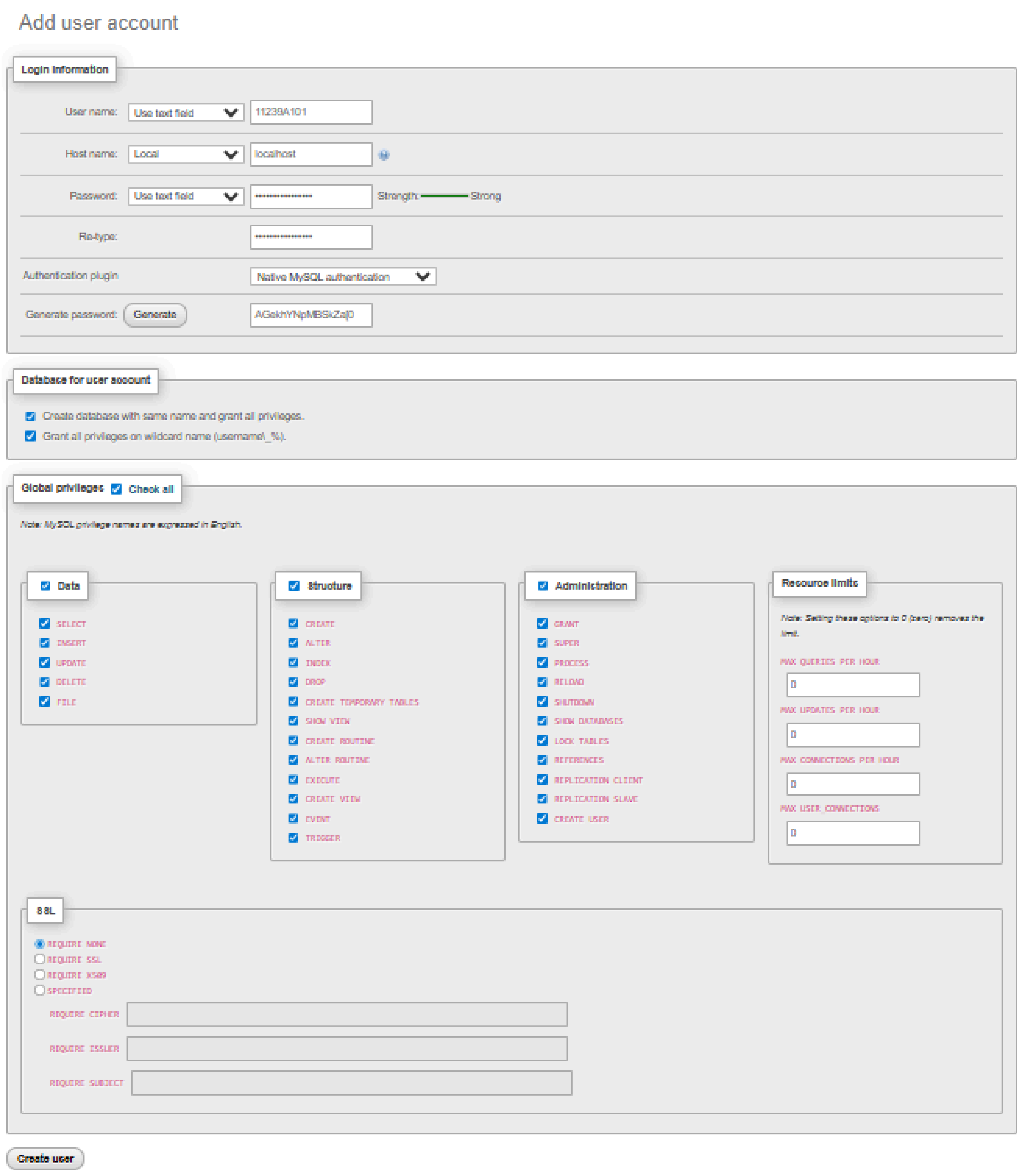
```
SELECT SupplierName, City FROM Suppliers WHERE SupplierID = 5;

SELECT SupplierName, SupplierID FROM Suppliers WHERE SupplierID > 15;

SELECT SupplierName, SupplierID FROM Suppliers WHERE SupplierID < 4;

SELECT SupplierName, SupplierID FROM Suppliers WHERE SupplierID >= 10;

SELECT SupplierName, SupplierID FROM Suppliers WHERE SupplierID <= 6;

SELECT SupplierName, City FROM Suppliers WHERE City <> 'New York';
```

EXPERIMENT 12

Working on Local Host XAMPP Server

1. **Server Variables in XAMPP**: Provide environment and request details via PHP’s $_SERVER array.

OUTPUT:



Add user account

Login Information

User name: Use text field 11239A101

Host name: Local localhost

Password: Use text field •••••••••••••••• Strength: Strong

Re-type: ••••••••••••••••

Authentication plugin Native MySQL authentication

Generate password: Generate AGekhYNpMBSkZaj0

Database for user account

☑ Create database with same name and grant all privileges.

☑ Grant all privileges on wildcard name (username_%).

Global privileges ☑ Check all

Note: MySQL privilege names are expressed in English.

☑ Data

☑ SELECT
☑ INSERT
☑ UPDATE
☑ DELETE
☑ FILE

☑ Structure

☑ CREATE
☑ ALTER
☑ INDEX
☑ DROP
☑ CREATE TEMPORARY TABLES
☑ SHOW VIEW
☑ CREATE ROUTINE
☑ ALTER ROUTINE
☑ EXECUTE
☑ CREATE VIEW
☑ EVENT
☑ TRIGGER

☑ Administration

☑ GRANT
☑ SUPER
☑ PROCESS
☑ RELOAD
☑ SHUTDOWN
☑ SHOW DATABASES
☑ LOCK TABLES
☑ REFERENCES
☑ REPLICATION CLIENT
☑ REPLICATION SLAVE
☑ CREATE USER

Resource limits

Note: Setting these options to 0 (zero) removes the limit.

MAX QUERIES PER HOUR 0

MAX UPDATES PER HOUR 0

MAX CONNECTIONS PER HOUR 0

MAX USER_CONNECTIONS 0

SSL

● REQUIRE NONE
○ REQUIRE SSL
○ REQUIRE X509
○ SPECIFIED

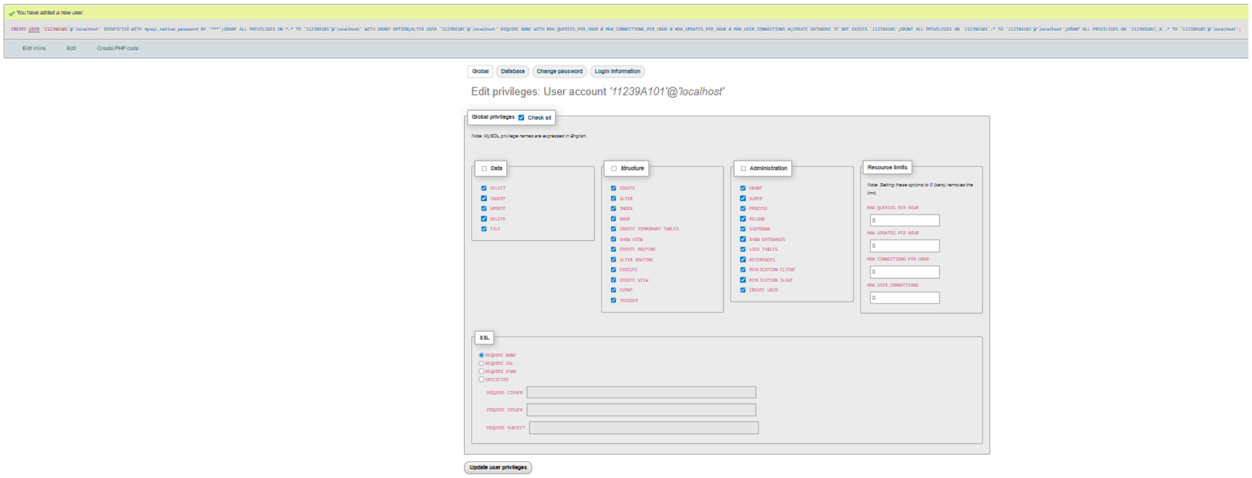
REQUIRE CIPHER

REQUIRE ISSUER

REQUIRE SUBJECT

2. **Hierarchical User Access in XAMPP**: Assign different privileges to MySQL users to control database access levels.

OUTPUT:



✓ You have added a new user.

```
CREATE USER '11239A101'@'localhost' IDENTIFIED WITH mysql_native_password BY '***';GRANT ALL PRIVILEGES ON *.* TO '11239A101'@'localhost' WITH GRANT OPTION;ALTER USER '11239A101'@'localhost' REQUIRE NONE WITH MAX_QUERIES_PER_HOUR 0 MAX_CONNECTIONS_PER_HOUR 0 MAX_UPDATES_PER_HOUR 0 MAX_USER_CONNECTIONS 0;CREATE DATABASE IF NOT EXISTS `11239A101`;GRANT ALL PRIVILEGES ON `11239A101`.* TO '11239A101'@'localhost';GRANT ALL PRIVILEGES ON `11239A101\_%`.* TO '11239A101'@'localhost';
```

Edit privileges: User account *'11239A101'@'localhost'*

Global privileges ☑ Check all

Note: MySQL privilege names are expressed in English.

□ Data
- ☑ SELECT
- ☑ INSERT
- ☑ UPDATE
- ☑ DELETE
- ☑ FILE

□ Structure
- ☑ CREATE
- ☑ ALTER
- ☑ INDEX
- ☑ DROP
- ☑ CREATE TEMPORARY TABLES
- ☑ SHOW VIEW
- ☑ CREATE ROUTINE
- ☑ ALTER ROUTINE
- ☑ EXECUTE
- ☑ CREATE VIEW
- ☑ EVENT
- ☑ TRIGGER

□ Administration
- ☑ GRANT
- ☑ SUPER
- ☑ PROCESS
- ☑ RELOAD
- ☑ SHUTDOWN
- ☑ SHOW DATABASES
- ☑ LOCK TABLES
- ☑ REFERENCES
- ☑ REPLICATION CLIENT
- ☑ REPLICATION SLAVE
- ☑ CREATE USER

Resource limits

Note: Setting these options to 0 (zero) removes the limit.

MAX QUERIES PER HOUR 0

MAX UPDATES PER HOUR 0

MAX CONNECTIONS PER HOUR 0

MAX USER_CONNECTIONS 0

SSL
- ● REQUIRE NONE
- ○ REQUIRE SSL
- ○ REQUIRE X509
- ○ SPECIFIED

REQUIRE CIPHER

REQUIRE ISSUER

REQUIRE SUBJECT