ENTERPRISE ARCHITECTURE

Lab Sheet 1 - JDBC

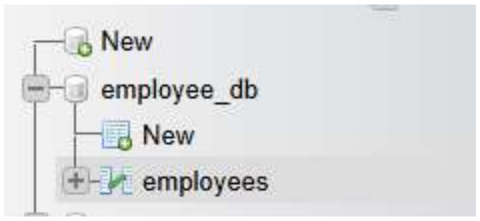
GAM/IT/2022/F/0096

Part 1: Set Up MySQL Database

- Install MySQL (if you haven't already) and create a database for the lab.
- Open MySQL Workbench or command line and execute the following SQL commands:

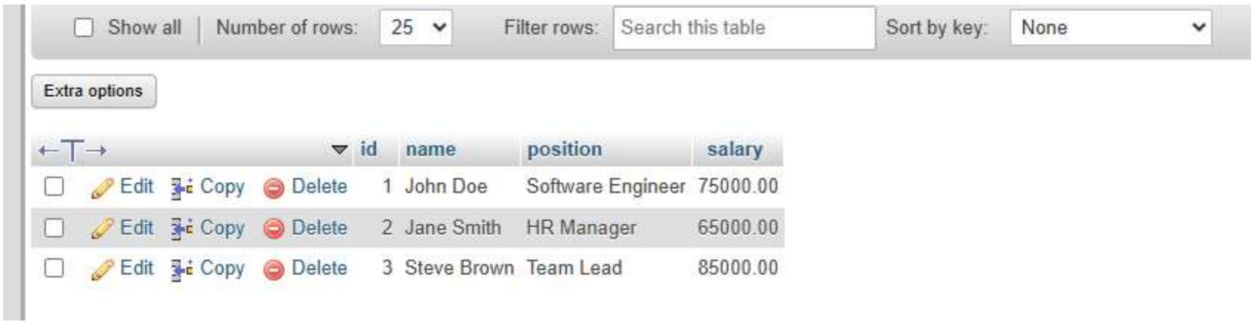
```
CREATE DATABASE employee_db;
CREATE TABLE employees (
id INT PRIMARY KEY AUTO_INCREMENT,
name VARCHAR(100),
position VARCHAR(100),
salary DECIMAL(10, 2)
);
```

Output:



```
INSERT INTO employees (name, position, salary) VALUES ('John Doe', 'Software Engineer', 75000);
INSERT INTO employees (name, position, salary) VALUES ('Jane Smith', 'HR Manager', 65000);
INSERT INTO employees (name, position, salary) VALUES ('Steve Brown', 'Team Lead', 85000);
```

Output:



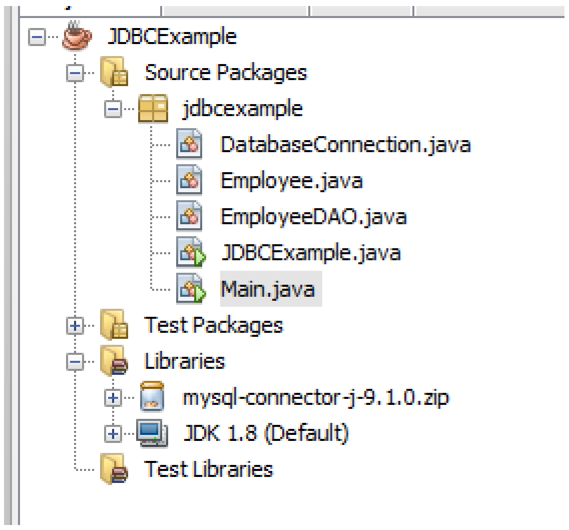
				id	name	position	salary
☐	Edit	Copy	Delete	1	John Doe	Software Engineer	75000.00
☐	Edit	Copy	Delete	2	Jane Smith	HR Manager	65000.00
☐	Edit	Copy	Delete	3	Steve Brown	Team Lead	85000.00

Part 2: Set Up NetBeans Project

1. Open NetBeans IDE 8.2.

2. Create a new Java application:
   - Go to File > New Project.
   - Select Java as the project type, and choose Java Application.
   - Name your project JDBCExample.
3. Add MySQL JDBC Driver to your project:
   - Right-click on the project in the Projects pane.
   - Select Properties.
   - In the Libraries tab, click Add JAR/Folder.
   - Navigate to the location of your mysql-connector-java-x.x.xx.jar file and add it.

Output:



```
JDBCExample
  Source Packages
    jdbcexample
      DatabaseConnection.java
      Employee.java
      EmployeeDAO.java
      JDBCExample.java
      Main.java
  Test Packages
  Libraries
    mysql-connector-j-9.1.0.zip
    JDK 1.8 (Default)
  Test Libraries
```

Part 3: Establish JDBC Connection

- Create a DatabaseConnection.java class to establish a connection to your database.

  package jdbcexample;

  import java.sql.Connection;

  import java.sql.DriverManager;

  import java.sql.SQLException;

  public class DatabaseConnection {

  private static final String URL = "jdbc:mysql://localhost:3306/employee_db"; // Database URL

```
private static final String USER = "root"; // Your MySQL username

private static final String PASSWORD = "password"; // Your MySQL password

public static Connection getConnection() throws SQLException {

  try {

        // Load the JDBC driver

        Class.forName("com.mysql.cj.jdbc.Driver");

        // Return the database connection

        return DriverManager.getConnection(URL, USER, PASSWORD);

        } catch (ClassNotFoundException | SQLException e) {

        System.out.println("Connection failed: " + e.getMessage());

        throw new SQLException("Failed to establish connection.");

    }

  }
```

Part 4: Perform CRUD Operations

- Create EmployeeDAO.java for CRUD Operations:

```
package jdbcexample;
import java.sql.*;
import java.util.ArrayList;
import java.util.List;
public class EmployeeDAO {
   // Create an employee
   public static void addEmployee(String name, String position, double salary) {
   String sql = "INSERT INTO employees (name, position, salary) VALUES (?, ?, ?)";
      try (Connection conn = DatabaseConnection.getConnection();
         PreparedStatement stmt = conn.prepareStatement(sql)) {
            stmt.setString(1, name);
            stmt.setString(2, position);
            stmt.setDouble(3, salary);
            int rowsAffected = stmt.executeUpdate();
            System.out.println("Employee added successfully. Rows affected: " + rowsAffected);
            } catch (SQLException e) {
            e.printStackTrace()
    }
        }
        // Read all employees
        public static List<Employee> getAllEmployees() {
            List<Employee> employees = new ArrayList<>();
            String sql = "SELECT * FROM employees";
            try (Connection conn = DatabaseConnection.getConnection();
                Statement stmt = conn.createStatement();
                ResultSet rs = stmt.executeQuery(sql)) {
                while (rs.next()) {
                    Employee employee = new Employee(
                        rs.getInt("id"),
                        rs.getString("name"),
                        rs.getString("position"),
                        rs.getDouble("salary")
                    );
                    employees.add(employee);
                }
            } catch (SQLException e) {
                e.printStackTrace();
            }
            return employees;
        }
        // Update an employee's information
        public static void updateEmployee(int id, String name, String position, double salary) {
            String sql = "UPDATE employees SET name = ?, position = ?, salary = ? WHERE id = ?";
            try (Connection conn = DatabaseConnection.getConnection();
                 PreparedStatement stmt = conn.prepareStatement(sql)) {

                stmt.setString(1, name);
                stmt.setString(2, position);
                stmt.setDouble(3, salary);
                stmt.setInt(4, id);

                int rowsAffected = stmt.executeUpdate();
                System.out.println("Employee updated successfully. Rows affected: " + rowsAffected);
            } catch (SQLException e) {
                e.printStackTrace();
            }
        }
        // Delete an employee
        public static void deleteEmployee(int id) {
            String sql = "DELETE FROM employees WHERE id = ?";
            try (Connection conn = DatabaseConnection.getConnection();
                 PreparedStatement stmt = conn.prepareStatement(sql)) {
                stmt.setInt(1, id);
                int rowsAffected = stmt.executeUpdate();
                System.out.println("Employee deleted successfully. Rows affected: " + rowsAffected);
            } catch (SQLException e) {
                e.printStackTrace();
            }
        }
    }
```

Part 5: Create Employee.java Class

- Create a simple Employee.java POJO (Plain Old Java Object) to represent employee data.

```
package jdbcexample;
public class Employee {
    private int id;
    private String name;
    private String position;
    private double salary;

    public Employee(int id, String name, String position, double salary) {
        this.id = id;
        this.name = name;
        this.position = position;
        this.salary = salary;
    }
    // Getters and setters
    public int getId() { return id; }
    public void setId(int id) { this.id = id; }
    public String getName() { return name; }
    public void setName(String name) { this.name = name; }
    public String getPosition() { return position; }
    public void setPosition(String position) { this.position = position; }
    public double getSalary() { return salary; }
    public void setSalary(double salary) { this.salary = salary; }
    @Override
    public String toString() {
        return "Employee{id=" + id + ", name='" + name + "', position='" + position + "', salary=" + salary +
'}';
    }
}
```

Part 6: **Test the Application**

- Create a **Main.java** class to test the CRUD operations.

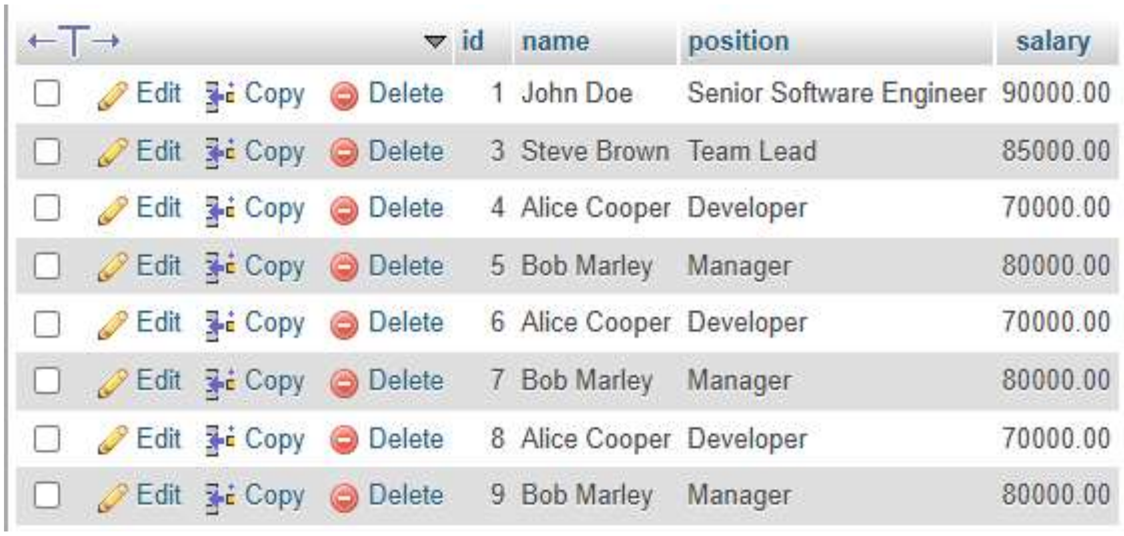
```
package jdbcexample;

import java.util.List;

public class Main {

    public static void main(String[] args) {

        // Add employees

    EmployeeDAO.addEmployee("Alice Cooper", "Developer", 70000);

    EmployeeDAO.addEmployee("Bob Marley", "Manager", 80000);

        // Update employee

     EmployeeDAO.updateEmployee(1, "John Doe", "Senior Software Engineer", 90000);

        // Get all employees

        List<Employee> employees = EmployeeDAO.getAllEmployees();

        employees.forEach(System.out::println);

        // Delete employee

        EmployeeDAO.deleteEmployee(2);

    }

}
```

Part 7:

Run the Application

- **Run the program** and observe how the database is updated with the CRUD operations.
    - First, the employees will be added to the database.
    - Then, one employee's details will be updated.
    - All employees will be fetched and displayed in the console.
    - Finally, one employee will be deleted.

Output:



	id	name	position	salary
Edit Copy Delete	1	John Doe	Senior Software Engineer	90000.00
Edit Copy Delete	3	Steve Brown	Team Lead	85000.00
Edit Copy Delete	4	Alice Cooper	Developer	70000.00
Edit Copy Delete	5	Bob Marley	Manager	80000.00
Edit Copy Delete	6	Alice Cooper	Developer	70000.00
Edit Copy Delete	7	Bob Marley	Manager	80000.00
Edit Copy Delete	8	Alice Cooper	Developer	70000.00
Edit Copy Delete	9	Bob Marley	Manager	80000.00