Experiment No. 3

Develop a JSP application that integrates JDBC to perform CRUD (Create, Read, Update, and Delete) operations on a `students` database table. The application should:

- Create: Insert new student records with fields such as roll-no, name, email, and age.
- Read: Retrieve and display all student records from the database.
- Update: Modify existing student records.
- Delete: Remove student records from the database.

Student.java

```
package com.student.model;

public class Student {
    private int rollNo;
    private String name;
    private String email;
    private int age;

    // Constructors, Getters, and Setters
    public Student() { }

    public Student(int rollNo, String name, String email, int age) {
        this.rollNo = rollNo;
        this.name = name;
        this.email = email;
        this.age = age;
    }

    public int getRollNo() { return rollNo; }
    public void setRollNo(int rollNo) { this.rollNo = rollNo; }

    public String getName() { return name; }
    public void setName(String name) { this.name = name; }

    public String getEmail() { return email; }
    public void setEmail(String email) { this.email = email; }

    public int getAge() { return age; }
    public void setAge(int age) { this.age = age; }
}
```

DBUtil.java

```
package com.student.util;

import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.SQLException;

public class DBUtil {
    private static final String URL =
"jdbc:mysql://localhost:3306/student";
```

```
    private static final String USERNAME = "student";
    private static final String PASSWORD = "student";

    public static Connection getConnection() throws SQLException {
        try {
            Class.forName("com.mysql.jdbc.Driver");
        } catch (ClassNotFoundException e) {
            e.printStackTrace();
        }
        return DriverManager.getConnection(URL, USERNAME, PASSWORD);
    }
}
```

StudentDAO.java

```
package com.student.dao;

import com.student.model.Student;
import com.student.util.DBUtil;

import java.sql.*;
import java.util.ArrayList;
import java.util.List;

public class StudentDAO {

    // Insert student
    public void addStudent(Student student) throws SQLException {
        Connection con = DBUtil.getConnection();
        String query = "INSERT INTO students(roll_no, name, email,
age) VALUES(?, ?, ?, ?)";
        PreparedStatement ps = con.prepareStatement(query);
        ps.setInt(1, student.getRollNo());
        ps.setString(2, student.getName());
        ps.setString(3, student.getEmail());
        ps.setInt(4, student.getAge());
        ps.executeUpdate();
        ps.close();
        con.close();
    }

    // Retrieve all students
    public List<Student> getAllStudents() throws SQLException {
        List<Student> students = new ArrayList<>();
        Connection con = DBUtil.getConnection();
        Statement stmt = con.createStatement();
        String query = "SELECT * FROM students";
        ResultSet rs = stmt.executeQuery(query);
        while (rs.next()) {
            Student student = new Student();
            student.setRollNo(rs.getInt("roll_no"));
            student.setName(rs.getString("name"));
            student.setEmail(rs.getString("email"));
            student.setAge(rs.getInt("age"));
```

```
            students.add(student);
        }
        rs.close();
        stmt.close();
        con.close();
        return students;
    }

    // Update student
    public void updateStudent(Student student) throws SQLException {
        Connection con = DBUtil.getConnection();
        String query = "UPDATE students SET name = ?, email = ?, age
= ? WHERE roll_no = ?";
        PreparedStatement ps = con.prepareStatement(query);
        ps.setString(1, student.getName());
        ps.setString(2, student.getEmail());
        ps.setInt(3, student.getAge());
        ps.setInt(4, student.getRollNo());
        ps.executeUpdate();
        ps.close();
        con.close();
    }

    // Delete student
    public void deleteStudent(int rollNo) throws SQLException {
        Connection con = DBUtil.getConnection();
        String query = "DELETE FROM students WHERE roll_no = ?";
        PreparedStatement ps = con.prepareStatement(query);
        ps.setInt(1, rollNo);
        ps.executeUpdate();
        ps.close();
        con.close();
    }
}
```

index.jsp

```
<%@page language="java" contentType="text/html; charset=UTF-8"
pageEncoding="UTF-8"%>
<html>
<head>
    <title>Student Management</title>
</head>
<body>
    <h1>Student Management</h1>
    <a href="list-student.jsp">View Students</a><br>
      <a href="add-student.jsp">Add New Student</a>
</body>
</html>
```

add-student.jsp

```
<%@page language="java" contentType="text/html; charset=UTF-8"
pageEncoding="UTF-8"%>
<%@page import="com.student.dao.StudentDAO"%>
<%@page import="com.student.model.Student"%>
<%@page import="java.sql.SQLException"%>

<html>
<head>
    <title>Add Student</title>
</head>
<body>
    <h2>Add Student</h2>
    <form action="add-student.jsp" method="post">
        Roll No: <input type="text" name="rollNo"><br>
        Name: <input type="text" name="name"><br>
        Email: <input type="text" name="email"><br>
        Age: <input type="text" name="age"><br>
        <input type="submit" value="Add Student">
    </form>

    <%
        if (request.getMethod().equals("POST")) {
            int rollNo =
Integer.parseInt(request.getParameter("rollNo"));
            String name = request.getParameter("name");
            String email = request.getParameter("email");
            int age = Integer.parseInt(request.getParameter("age"));

            Student student = new Student(rollNo, name, email, age);
            StudentDAO dao = new StudentDAO();

            try {
                  dao.addStudent(student);
             }
            catch(SQLEXception e){ }

            out.println("<p>Student added successfully!</p>");
        }
    %>
    <a href="index.jsp">Back to Home</a>
</body>
</html>
```

list-student.jsp

```
<%@page language="java" contentType="text/html; charset=UTF-8"
pageEncoding="UTF-8"%>
<%@page import="com.student.dao.StudentDAO"%>
<%@page import="com.student.model.Student"%>
<%@page import="java.util.List"%>
<%@page import="java.sql.SQLException" %>
<html>
```

```
<head>
    <title>List Students</title>
</head>
<body>
    <h2>Student List</h2>
    <table border="1">
        <tr>
            <th>Roll No</th>
            <th>Name</th>
            <th>Email</th>
            <th>Age</th>
            <th>Actions</th>
        </tr>
        <%
            StudentDAO dao = new StudentDAO();

            try {
                List<Student> students = dao.getAllStudents();
            }
            catch(SQLException e){ }

            for (Student student : students) {
        %>
        <tr>
            <td><%= student.getRollNo() %></td>
            <td><%= student.getName() %></td>
            <td><%= student.getEmail() %></td>
            <td><%= student.getAge() %></td>
            <td>
                <a href="update-student.jsp?rollNo=<%=
student.getRollNo() %>">Update</a>
                <a href="delete-student.jsp?rollNo=<%=
student.getRollNo() %>">Delete</a>
            </td>
        </tr>
        <% } %>
    </table>
    <a href="index.jsp">Back to Home</a>
</body>
</html>
```

update-student.jsp

```
<%@page language="java" contentType="text/html; charset=UTF-8"
pageEncoding="UTF-8"%>
<%@page import="com.student.dao.StudentDAO"%>
<%@page import="com.student.model.Student"%>
<%@page import="java.sql.SQLException"%>

<html>
<head>
    <title>Update Student</title>
</head>
<body>
    <h2>Update Student</h2>
```

```
    <%
        int rollNo =
Integer.parseInt(request.getParameter("rollNo"));
        StudentDAO dao = new StudentDAO();
        Student student = dao.getAllStudents().stream().filter(s ->
s.getRollNo() == rollNo).findFirst().orElse(null);
    %>
    <form action="update-student.jsp" method="post">
        Roll No: <%= student.getRollNo() %> (readonly)<br>
        Name: <input type="text" name="name" value="<%=
student.getName() %>"><br>
        Email: <input type="text" name="email" value="<%=
student.getEmail() %>"><br>
        Age: <input type="text" name="age" value="<%=
student.getAge() %>"><br>
        <input type="hidden" name="rollNo" value="<%=
student.getRollNo() %>">
        <input type="submit" value="Update Student">
    </form>

    <%
        if (request.getMethod().equals("POST")) {
            int rollNoUpdate =
Integer.parseInt(request.getParameter("rollNo"));
            String name = request.getParameter("name");
            String email = request.getParameter("email");
            int age = Integer.parseInt(request.getParameter("age"));

            Student updatedStudent = new Student(rollNoUpdate, name,
email, age);

           try {
                dao.updateStudent(updatedStudent);
           }
           catch(SQLException e){ }

            out.println("<p>Student updated successfully!</p>");
        }
    %>
    <a href="list-student.jsp">Back to List</a>
</body>
</html>
```

delete-student.jsp

```
<%@page import="com.student.dao.StudentDAO"%>
<%@page import="java.sql.SQLException"%>

<html>
<head>
    <title>Delete Student</title>
</head>
<body>
```

```
    <h2>Delete Student</h2>

    <!-- Form to input the USN (roll number) of the student to
delete -->
    <form action="delete-student.jsp" method="post">

        Enter Roll No (USN) of the student to delete:

        <input type="text" name="rollNo"><br><br>

        <input type="submit" value="Delete Student">

    </form>


    <%

        // Handle form submission

        if (request.getMethod().equals("POST")) {

            String rollNoStr = request.getParameter("rollNo");


            if (rollNoStr != null && !rollNoStr.trim().isEmpty()) {

                int rollNo = Integer.parseInt(rollNoStr);

                StudentDAO dao = new StudentDAO();


                try {

                    dao.deleteStudent(rollNo);

                    out.println("<p>Student with Roll No " + rollNo
+ " has been deleted successfully!</p>");

                } catch (SQLException e) {

                    out.println("<p>Error occurred while deleting
the student. Please try again.</p>");

                    e.printStackTrace();

                }

            } else {

                out.println("<p>Please enter a valid Roll No.</p>");

            }

        }
```

```
    %>

    <br>
    <a href="index.jsp">Back to Home</a>
</body>
</html>
```

MySql server database

- **Logging in to mysql**

  ```
  mysql -u -p student
  password: student
  ```

- **select the database for use**

  ```
  use student;
  ```

- **Query to create the table in MySql**

  ```
  create table students (roll_no integer(4) primary key, name
  varchar(150), email varchar(150), age integer(3));
  ```

- **Query to describe the table schema**

  ```
  desc students;
  ```

- **Query to select and display all the rows and columns of the table**

  ```
  select * from students;
  ```