UNIVERSITI MALAYSIA TERENGGANU

CSM3023 WEB PROGRAMMING 2

BACHELOR OF COMPUTER SCIENCE (MOBILE COMPUTING) WITH HONORS

LAB 8

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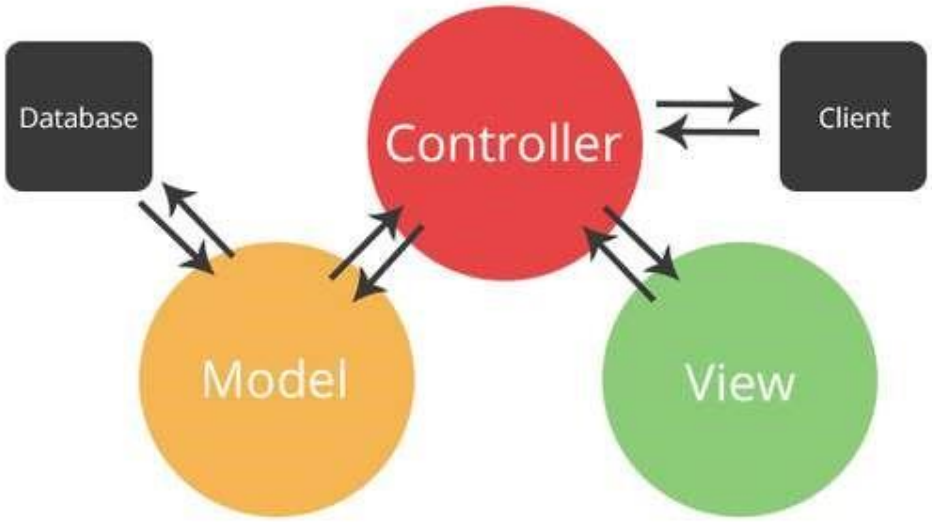
LAB 8

An MVC Example with Servlets and JSP



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Arahan:

Manual makmal ini adalah untuk kegunaan pelajar-pelajar Fakulti Teknologi Kejuruteraan Kelautan dan Informatik - FTKKI, Universiti Malaysia Terengganu (UMT) sahaja. Tidak dibenarkan mencetak dan mengedar manual ini tanpa kebenaran rasmi daripada penulis.

Sila ikuti langkah demi langkah sebagaimana yang dinyatakan di dalam manual. Tandakan (√) setiap langkah yang telah selesai dibuat dan tulis kesimpulan bagi setiap aktiviti yang telah selesai dijalankan.

Instruction:

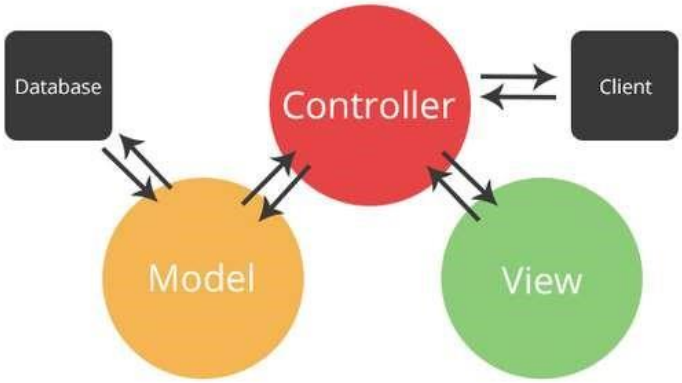
This laboratory manual is for use by the students of the Faculty of Ocean Engineering Technology and Informatics (FTKKI), Universiti Malaysia Terengganu only.

It is not permissible to print and distribute this manual without the official authorisation of the author. Please follow step by step as described in the manual. Tick (√) each step completed and write the conclusions for each completed activity.

Creating MVC Database Web Application in JSP and Servlets – for Create, Read, Update, Delete

MVC Pattern stands for Model-View-Controller Pattern. This pattern is used to separate application's concerns.

- Model - Model represents an object or JAVA POJO carrying data. It can also have logic to update controller if its data changes.
- View - View represents the visualization of the data that model contains.
- Controller - Controller acts on both model and view. It controls the data flow into model object and updates the view whenever data changes. It keeps view and model separate.



Benefits of MVC in JSP and Servlet Web Application

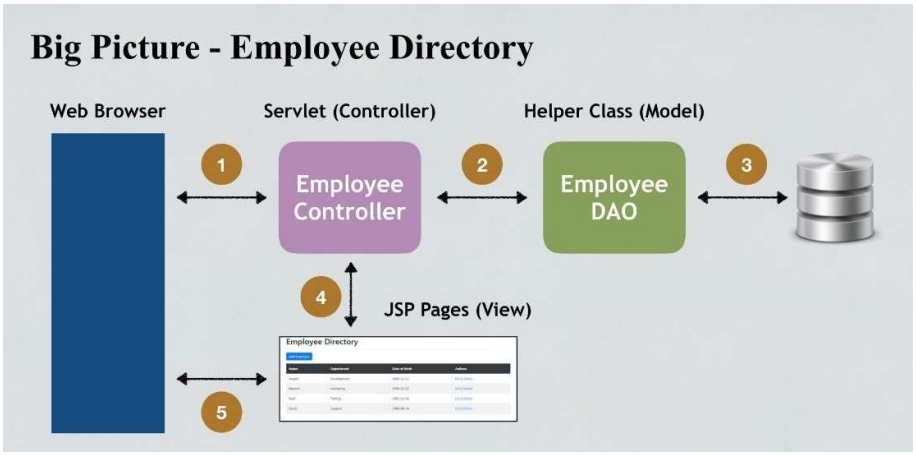
- Minimizes HTML code in Servlet no more: out.println(…) in Servlet code.
- Minimize Java business logic in JSPs no more large scriptlets in JSP code
- It separates the presentation layer from the business layer
- The Controller performs the action of invoking the Model and sending data to View
- The Model is not even aware that it is used by some web application or a desktop application

In this Lab8 activity, student will follow step by step to create a MVC application using JSP, Servlet and MySQL to create, read, update, and delete (CRUD) the student records into the database.

Steps Involved in the Application

Basically, there are 4 main steps involved in this application that are given below:

- Capture the employee records and store it into the database.
- Fetch the employee records from the database and display it on the JSP.
- Update the existing employee records into the database.
- Delete the employee records from the database.



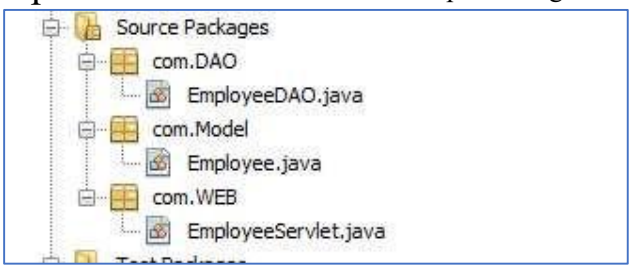
Step by step of Application development:

Step 1 - Create table employees in COMPANY database schema.

```sql
CREATE DATABASE IF NOT EXISTS Company;
USE Company;

CREATE TABLE IF NOT EXISTS employees (
    id INT NOT NULL AUTO_INCREMENT,
    Name VARCHAR(60),
    Email VARCHAR(50),
    Position VARCHAR(15),
    PRIMARY KEY (id)
)
```

Step 2 - Create new web application project, named as Employee_Management.

Step 3 - Create three Java class that representing :



- EmployeeDAO.java (act as a Data Access Object (DAO) and to open /close database connection),
- Employee.java (act as a JavaBeans to represent business object), and
- EmployeeServlet.java (act to perform CRUD process)

EmployeeDAO.java

Name the package as com.DAO

```java
/*
 * To change this license header, choose License Headers in Project Properties.
 * To change this template file, choose Tools | Templates
 * and open the template in the editor.
 */
package com.DAO;

import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.PreparedStatement;
import java.sql.ResultSet;
import java.sql.SQLException;
import java.util.ArrayList;
import java.util.List;

import com.Model.Employee;

public class EmployeeDAO {
    Connection connection = null;
    private String jdbcURL = "jdbc:mysql://localhost:3306/company";
    private String jdbcUsername = "yusro";
    private String jdbcPassword = "admin";

    private static final String INSERT_EMPLOYEES_SQL = "INSERT INTO employees (name, email, position) VALUES " +
        " (?, ?, ?);";

    private static final String SELECT_EMPLOYEE_BY_ID = "select id,name,email,position from employees where id =?";
    private static final String SELECT_ALL_EMPLOYEES = "select * from employees";
    private static final String DELETE_EMPLOYEES_SQL = "delete from employees where id = ?;";
```

```java
    private static final String UPDATE_EMPLOYEES_SQL = "update employees set name = ?,email= ?, position =? where id = ?;";

    public EmployeeDAO() {}

     protected Connection getConnection() {
       Connection connection = null;
       try {
           Class.forName("com.mysql.jdbc.Driver");
           connection = DriverManager.getConnection(jdbcURL, jdbcUsername, jdbcPassword);
       } catch (SQLException e) {
           // TODO Auto-generated catch block
           e.printStackTrace();
       } catch (ClassNotFoundException e) {
           // TODO Auto-generated catch block
           e.printStackTrace();
       }
       return connection;
    }

    public void insertEmployee(Employee employee) throws SQLException {
        System.out.println(INSERT_EMPLOYEES_SQL);
        // try-with-resource statement will auto close the connection.
        try (Connection connection = getConnection(); PreparedStatement preparedStatement =
                connection.prepareStatement(INSERT_EMPLOYEES_SQL)) {
            preparedStatement.setString(1, employee.getName());
            preparedStatement.setString(2, employee.getEmail());
            preparedStatement.setString(3, employee.getPosition());
            System.out.println(preparedStatement);
            preparedStatement.executeUpdate();
```

```java
        } catch (SQLException e) {
            printSQLException(e);
        }
    }

    public Employee selectEmployee(int id) {
        Employee employee = null;
        // Step 1: Establishing a Connection
        try (Connection connection = getConnection();
            // Step 2:Create a statement using connection object
            PreparedStatement preparedStatement = connection.prepareStatement(SELECT_EMPLOYEE_BY_ID);) {
            preparedStatement.setInt(1, id);
            System.out.println(preparedStatement);
            // Step 3: Execute the query or update query
            ResultSet rs = preparedStatement.executeQuery();

            // Step 4: Process the ResultSet object.
            while (rs.next()) {
                String name = rs.getString("name");
                String email = rs.getString("email");
                String position = rs.getString("position");
                employee = new Employee(id, name, email, position);
            }
        } catch (SQLException e) {
            printSQLException(e);
        }
        return employee;
    }
```

```
87
88      public List < Employee > selectAllEmployees() {
89
90          // using try-with-resources to avoid closing resources (boiler plate code)
91          List < Employee > employees = new ArrayList < > ();
92          // Step 1: Establishing a Connection
94          try (Connection connection = getConnection();
95
96              // Step 2:Create a statement using connection object
97              PreparedStatement preparedStatement =
98                      connection.prepareStatement(SELECT_ALL_EMPLOYEES);) {
99              System.out.println(preparedStatement);
100             // Step 3: Execute the query or update query
101             ResultSet rs = preparedStatement.executeQuery();
102
103             // Step 4: Process the ResultSet object.
104             while (rs.next()) {
105                 int id = rs.getInt("id");
106                 String name = rs.getString("name");
107                 String email = rs.getString("email");
108                 String position = rs.getString("position");
109                 employees.add(new Employee(id, name, email, position));
110             }
111         } catch (SQLException e) {
112             printSQLException(e);
113         }
114         return employees;
115     }
```

```
116     public boolean deleteEmployee(int id) throws SQLException {
117         boolean rowDeleted;
119         try (Connection connection = getConnection(); PreparedStatement statement =
120                 connection.prepareStatement(DELETE_EMPLOYEES_SQL);) {
121             statement.setInt(1, id);
122             rowDeleted = statement.executeUpdate() > 0;
123         }
124         return rowDeleted;
125     }
126
127     public boolean updateEmployee(Employee employee) throws SQLException {
128         boolean rowUpdated;
129         try (Connection connection = getConnection(); PreparedStatement statement =
130                 connection.prepareStatement(UPDATE_EMPLOYEES_SQL);) {
131             statement.setString(1, employee.getName());
132             statement.setString(2, employee.getEmail());
133             statement.setString(3, employee.getPosition());
134             statement.setInt(4, employee.getId());
135
136             rowUpdated = statement.executeUpdate() > 0;
137         }
138         return rowUpdated;
139     }
```

```
139
140     private void printSQLException(SQLException ex) {
141         for (Throwable e: ex) {
142             if (e instanceof SQLException) {
143                 e.printStackTrace(System.err);
144                 System.err.println("SQLState: " + ((SQLException) e).getSQLState());
145                 System.err.println("Error Code: " + ((SQLException) e).getErrorCode());
146                 System.err.println("Message: " + e.getMessage());
147                 Throwable t = ex.getCause();
148                 while (t != null) {
149                     System.out.println("Cause: " + t);
150                     t = t.getCause();
151                 }
152             }
153         }
154     }
155 }
156
```

Employee.java

Name the package as com.Model

```java
/*
 * To change this license header, choose License Headers in Project Properties.
 * To change this template file, choose Tools | Templates
 * and open the template in the editor.
 */
package com.Model;

public class Employee {
    protected int id;
    protected String name;
    protected String email;
    protected String position;

    public Employee() {}

    public Employee(String name, String email, String position) {
        super();
        this.name = name;
        this.email = email;
        this.position = position;
    }

    public Employee(int id, String name, String email, String position) {
        super();
        this.id = id;
        this.name = name;
        this.email = email;
        this.position = position;
    }

    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 getEmail() {
        return email;
    }
    public void setEmail(String email) {
        this.email = email;
    }
    public String getPosition() {
        return position;
    }
    public void setPosition(String position) {
        this.position = position;
    }
}
```

EmployeeServlet.java

Name the package as com.WEB

```java
/*
 * To change this license header, choose License Headers in Project Properties.
 * To change this template file, choose Tools | Templates
 * and open the template in the editor.
 */
package com.WEB;

import java.io.IOException;
import java.sql.SQLException;
import java.util.List;

import javax.servlet.RequestDispatcher;
import javax.servlet.ServletException;
import javax.servlet.annotation.WebServlet;
import javax.servlet.http.HttpServlet;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;

import com.DAO.EmployeeDAO;
import com.Model.Employee;

@WebServlet("/")
public class EmployeeServlet extends HttpServlet {
    // private static final long serialVersionUID = 1 L;
    private EmployeeDAO employeeDAO;

    public void init() {
        employeeDAO = new EmployeeDAO();
    }

    protected void doPost(HttpServletRequest request, HttpServletResponse response)
    throws ServletException, IOException {
        doGet(request, response);
    }

    protected void doGet(HttpServletRequest request, HttpServletResponse response)
    throws ServletException, IOException {
        String action = request.getServletPath();

        try {
            switch (action) {
                case "/new":
                    showNewForm(request, response);
                    break;
                case "/insert":
                    insertEmployee(request, response);
                    break;
                case "/delete":
                    deleteEmployee(request, response);
                    break;
                case "/edit":
                    showEditForm(request, response);
                    break;
                case "/update":
                    updateEmployee(request, response);
                    break;
                default:
                    listEmployee(request, response);
                    break;
            }
        } catch (SQLException ex) {
            throw new ServletException(ex);
        }
    }

    private void listEmployee(HttpServletRequest request, HttpServletResponse response)
    throws SQLException, IOException, ServletException {
        List < Employee > listEmployee = employeeDAO.selectAllEmployees();
        request.setAttribute("listEmployee", listEmployee);
        RequestDispatcher dispatcher = request.getRequestDispatcher("employeeList.jsp");
        dispatcher.forward(request, response);
    }

    private void showNewForm(HttpServletRequest request, HttpServletResponse response)
    throws ServletException, IOException {
        RequestDispatcher dispatcher = request.getRequestDispatcher("employeeForm.jsp");
        dispatcher.forward(request, response);
    }

    private void showEditForm(HttpServletRequest request, HttpServletResponse response)
    throws SQLException, ServletException, IOException {
        int id = Integer.parseInt(request.getParameter("id"));
        Employee existingEmployee = employeeDAO.selectEmployee(id);
        RequestDispatcher dispatcher = request.getRequestDispatcher("employeeForm.jsp");
        request.setAttribute("employee", existingEmployee);
        dispatcher.forward(request, response);

    }
```

```
    private void insertEmployee(HttpServletRequest request, HttpServletResponse response)
    throws SQLException, IOException {
        String name = request.getParameter("name");
        String email = request.getParameter("email");
        String position = request.getParameter("position");
        Employee newEmployee = new Employee(name, email, position);
        employeeDAO.insertEmployee(newEmployee);
        response.sendRedirect("list");
    }

    private void updateEmployee(HttpServletRequest request, HttpServletResponse response)
    throws SQLException, IOException {
        int id = Integer.parseInt(request.getParameter("id"));
        String name = request.getParameter("name");
        String email = request.getParameter("email");
        String position = request.getParameter("position");

        Employee employee= new Employee(id, name, email, position);
        employeeDAO.updateEmployee(employee);
        response.sendRedirect("list");
    }

    private void deleteEmployee(HttpServletRequest request, HttpServletResponse response)
    throws SQLException, IOException {
        int id = Integer.parseInt(request.getParameter("id"));
        employeeDAO.deleteEmployee(id);
        response.sendRedirect("list");

    }
}
```

Step 4 - Create these files:

1. File web.xml

   Java web applications use a deployment descriptor file to determine how URLs map to servlets, which URLs require authentication, and other information. This file is named web.xml, and resides in the app's WAR under the WEB-INF/ directory. web.xml is part of the servlet standard for web applications.

2. File EmployeeForm.jsp (used for Add and Edit/Update process)

```
<%@ page language="java" contentType="text/html; charset=UTF-8"  pageEncoding="UTF-8"%>
<%@ taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
<!DOCTYPE html>
<html>
<head>
    <title>Employee Management Application</title>
    <link rel="stylesheet" href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css"
        integrity="sha384-ggOyR0iXCbMQv3Xipma34MD+dH/1fQ784/j6cY/iJTQUOhcWr7x9JvoRxT2MZw1T" crossorigin="anonymous">
</head>
<body>
    <header>
        <nav class="navbar navbar-expand-md navbar-dark" style="background-color: tomato">
            <div>
                <a href="" class="navbar-brand"> Employee Management App </a>
            </div>

            <ul class="navbar-nav">
                <li><a href="<%=request.getContextPath()%>/list" class="nav-link">Employees</a></li>
            </ul>
        </nav>
    </header>
    <br>
    <div class="container col-md-5">
        <div class="card">
            <div class="card-body">
                <c:if test="${employee != null}">
                    <form action="update" method="post">
                </c:if>
                <c:if test="${employee == null}">
```

```
                <form action="insert" method="post">
            </c:if>

            <h2>
                <c:if test="${employee != null}">
                    Edit Employee
                </c:if>
                <c:if test="${employee == null}">
                    Add New Employee
                </c:if>
            </h2>

            <c:if test="${employee != null}">
                <input type="hidden" name="id" value="<c:out value='${employee.id}' />" />
            </c:if>

            <fieldset class="form-group">
                <label>Employee Name</label> <input type="text" value="<c:out value='${employee.name}' />"
                                                    class="form-control" name="name" required="required">
            </fieldset>

            <fieldset class="form-group">
                <label>Employee Email</label> <input type="text" value="<c:out value='${employee.email}' />"
                                                     class="form-control" name="email">
            </fieldset>
```

```
            <fieldset class="form-group">
                <label>Employee Position</label>
                    <input type="text" value="<c:out value='${employee.position}' />" class="form-control" readonly >
                    <input list="positionList" id="position" class="form-control" name="position" >
                    <datalist id="positionList">
                        <option value="Manager">
                        <option value="Head of Dept">
                        <option value="Supervisor">
                        <option value="Director">
                    </datalist>
            </fieldset>

            <button type="submit" class="btn btn-success">Save</button>
            </form>
        </div>
    </div>
</div>
</body>
</html>
```

3. File EmployeeList.jsp (used for displaying all employee records)

```
<%@ page language="java" contentType="text/html; charset=UTF-8" pageEncoding="UTF-8"%>
<%@ taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>

<!DOCTYPE html>
<html>

<head>
    <title>Employee Management Application</title>
    <link rel="stylesheet" href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css"
        integrity="sha384-ggOyR0iXCbMQv3Xipma34MD+dH/1fQ784/j6cY/iJTQUOhcWr7x9JvoRxT2MZw1T" crossorigin="anonymous">
</head>

<body>

    <header>
        <nav class="navbar navbar-expand-md navbar-dark" style="background-color: tomato">
            <div>
                <a href="" class="navbar-brand"> Employee Management App </a>
            </div>

            <ul class="navbar-nav">
                <li><a href="<%=request.getContextPath()%>/list" class="nav-link">Employees</a></li>
            </ul>
        </nav>
    </header>
    <br>
```

```
    <div class="row">
        <!-- <div class="alert alert-success" *ngIf='message'>{{message}}</div> -->

        <div class="container">
            <h3 class="text-center">List of Employees</h3>
            <hr>
            <div class="container text-left">
                <a href="<%=request.getContextPath()%>/new" class="btn btn-success">Add New Employee</a>
            </div>
            <br>
            <table class="table table-bordered">
                <thead>
                    <tr>
                        <th>ID</th>
                        <th>Name</th>
                        <th>Email</th>
                        <th>Position</th>
                        <th>Actions</th>
                    </tr>
                </thead>
```

```
                <tbody>
                    <!--   for (Todo todo: todos) {  -->
                    <c:forEach var="employee" items="${listEmployee}">
                        <tr>
                            <td>
                                <c:out value="${employee.id}" />
                            </td>
                            <td>
                                <c:out value="${employee.name}" />
                            </td>
                            <td>
                                <c:out value="${employee.email}" />
                            </td>
                            <td>
                                <c:out value="${employee.position}" />
                            </td>
                            <td><a href="edit?id=<c:out value='${employee.id}' />">Edit</a>     
                                <a href="delete?id=<c:out value='${employee.id}' />">Delete</a></td>
                        </tr>
                    </c:forEach>
                </tbody>
            </table>
        </div>
    </div>
</body>

</html>
```

4. File error.jsp

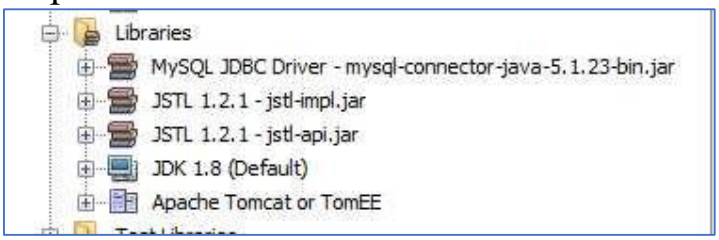
```
<%@ page language="java" contentType="text/html; charset=UTF-8" pageEncoding="UTF-8" isErrorPage="true" %>
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN" "http://www.w3.org/TR/html4/loose.dtd">
<html>
<head>
    <title>Error page</title>
</head>
<body>
    <center>
        <h1>Error</h1>
        <h2><%=exception.getMessage() %><br/> </h2>
    </center>
</body>
</html>
```

5. File index.jsp

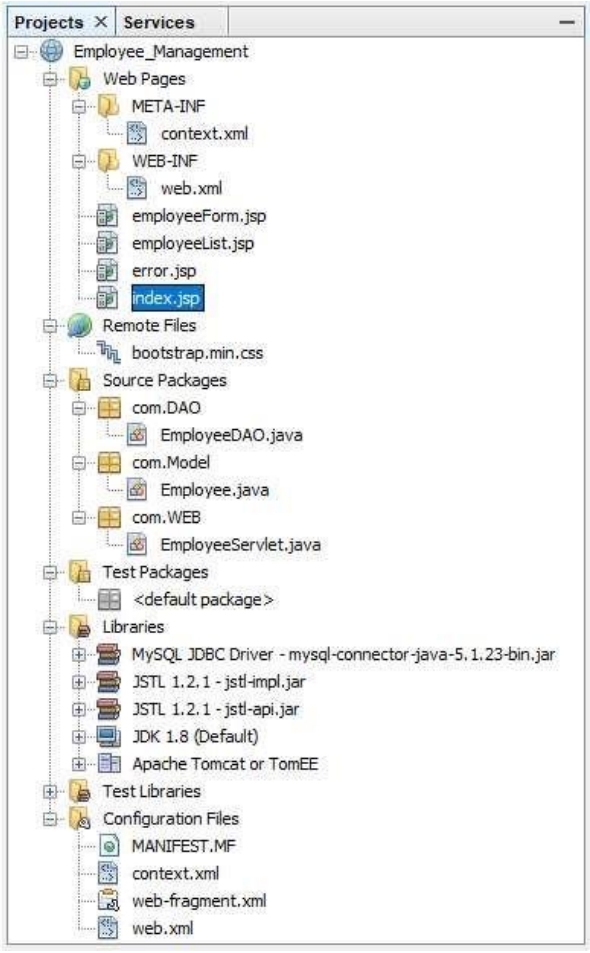
   Contents of the Index.jsp:

```jsp
<%@page contentType="text/html" pageEncoding="UTF-8"%>
<!DOCTYPE html>
<html>
    <head>
        <title>User Management Application</title>
        <link rel="stylesheet" href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css"
              integrity="sha384-ggOyR0iXCbMQv3Xipma34MD+dH/1fQ784/j6cY/iJTQUOhcWr7x9JvoRxT2MZw1T" crossorigin="anonymous">
    </head>

    <body>
        <h1>Application MVC system for Employee Management</h1><br>

        <ul>
            <li> <a href="http://localhost:8080/Employee Management/list"> All Employee List </a></li>
            <li> <a href="http://localhost:8080/Employee Management/new"> Add a New Employee </a></li>
            <li> <a href="http://localhost:8080/Employee Management/list"> Edit Employee  </a></li>
        </ul>

    </body>
</html>
```

Step 5 - Add these libraries:



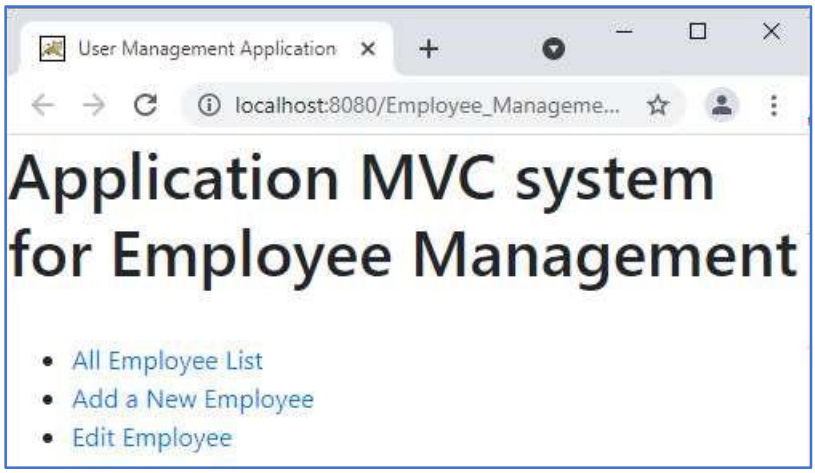
Finally, the Project schema should be like this:

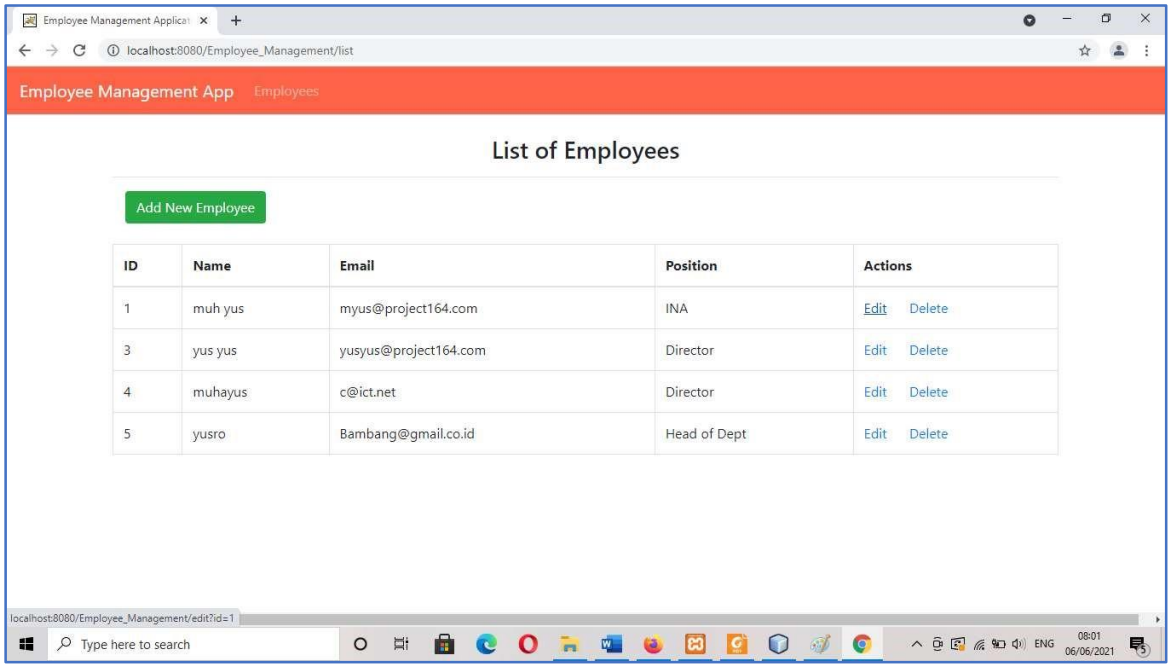


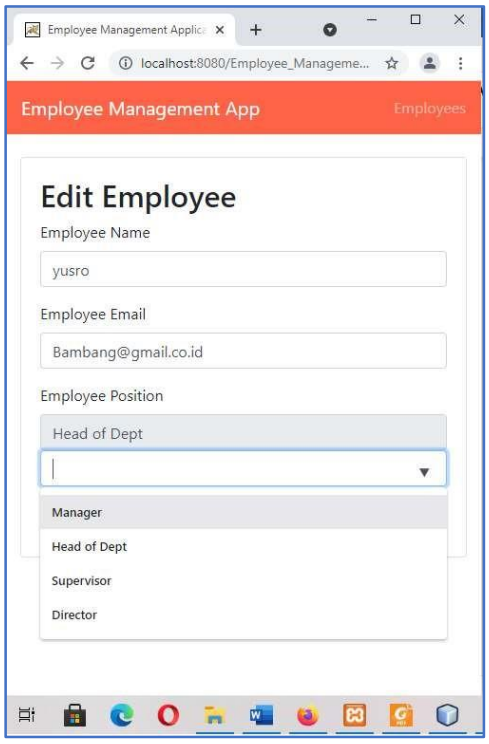
Step 6 - Running the program and try CRUD process:

1. Run index.jsp page.
2. Click List All User button to show all records.
3. Click Add User button to create new record.
4. Click hyperlink Update to do edit/update an existing record.
5. Click hyperlink Delete to do delete an existing record.

The result:







Coding EmployeeDAO.java

```
package com.DAO;

import java.sql.*;
import java.sql.SQLException;
import java.util.*;
import com.Model.Employee;

public class EmployeeDAO {
   Connection connection = null;
   private String jdbcURL = "jdbc:mysql://localhost:3306/company";
   private String jdbcUsername = "root";
   private String jdbcPassword = "admin";

   private static final String INSERT_EMPLOYEES_SQL = "INSERT INTO employees(name,
email, position) VALUES (?, ?, ?);";
   private static final String SELECT_EMPLOYEE_BY_ID = "select id,name,email,position from
employees where id=?";
   private static final String SELECT_ALL_EMPLOYEES = "select * from employees";
   private static final String DELETE_EMPLOYEES_SQL = "delete from employees where id =
?;";
```

```
   private static final String UPDATE_EMPLOYEES_SQL = "update employees set name =
?,email= ?, position= ? where id = ?;";

   public EmployeeDAO(){}

      protected Connection getConnection(){
         Connection connection = null;
         try{
            Class.forName("com.mysql.cj.jdbc.Driver");
            connection = DriverManager.getConnection(jdbcURL, jdbcUsername,
jdbcPassword);
            System.out.println("Database connected!");
         }catch(SQLException e){
            e.printStackTrace();
         }catch(ClassNotFoundException e){
            e.printStackTrace();
         }
         return connection;
      }

   public void insertEmployee(Employee employee) throws SQLException{
      System.out.println(INSERT_EMPLOYEES_SQL);
      try(Connection connection = getConnection(); PreparedStatement preparedStatement =
            connection.prepareStatement(INSERT_EMPLOYEES_SQL)){
         preparedStatement.setString(1, employee.getName());
         preparedStatement.setString(2, employee.getEmail());
         preparedStatement.setString(3, employee.getPosition());
         System.out.println(preparedStatement);
         preparedStatement.executeUpdate();
      }catch(SQLException e){
         printSQLException(e);
            }
   }

   public Employee selectEmployee(int id){
      Employee employee = null;
      // Step 1: Establishing a Connection
      try(Connection connection = getConnection();
         // Step 2: Create a statement using connection
         PreparedStatement preparedStatement =
connection.prepareStatement(SELECT_EMPLOYEE_BY_ID);){
         preparedStatement.setInt(1, id);
         System.out.println(preparedStatement);
```

```
        ResultSet rs = preparedStatement.executeQuery();

        while(rs.next()){
            String name = rs.getString("name");
            String email = rs.getString("email");
            String position = rs.getString("position");
            employee = new Employee(id, name, email,position);
        }
    }catch (SQLException e){
            printSQLException(e);
            }
    return employee;
}

public List < Employee > selectAllEmployees(){
    List < Employee > employees = new ArrayList < > ();
    try (Connection connection = getConnection();

        PreparedStatement preparedStatement =
connection.prepareStatement(SELECT_ALL_EMPLOYEES);){
        System.out.println(preparedStatement);
        ResultSet rs = preparedStatement.executeQuery();

        while(rs.next()){
            int id = rs.getInt("id");
            String name = rs.getString("name");
            String email = rs.getString("email");
            String position = rs.getString("position");
            employees.add(new Employee(id, name, email, position));
        }
    }catch(SQLException e){
        printSQLException(e);
    }
    return employees;
}

public boolean deleteEmployee(int id) throws SQLException{
    boolean rowDeleted;
    try(Connection connection = getConnection(); PreparedStatement statement =
            connection.prepareStatement(DELETE_EMPLOYEES_SQL);){
        statement.setInt(1, id);
        rowDeleted = statement.executeUpdate() > 0;
    }
```

```
        return rowDeleted;
    }

    public boolean updateEmployee(Employee employee) throws SQLException{
        boolean rowUpdated;
        try(Connection connection = getConnection(); PreparedStatement statement =
                connection.prepareStatement(UPDATE_EMPLOYEES_SQL);){
            statement.setString(1, employee.getName());
            statement.setString(2, employee.getEmail());
            statement.setString(3, employee.getPosition());
            statement.setInt(4, employee.getId());

            rowUpdated = statement.executeUpdate() > 0;
        }
        return rowUpdated;
    }

    private void printSQLException(SQLException ex){
        for(Throwable e: ex){
            if(e instanceof SQLException){
                e.printStackTrace(System.err);
                System.err.println("SQLState: " + ((SQLException) e).getSQLState());
                System.err.println("Error Code: " + ((SQLException) e).getErrorCode());
                System.err.println("Message: " + e.getMessage());
                Throwable t = ex.getCause();
                while(t != null){
                    System.out.println("Cause: " + t);
                    t = t.getCause();
                }
            }
        }
    }
}
```

Coding Employee.java

```
package com.Model;



public class Employee {

    protected int id;
```

```
protected String name;

protected String email;

protected String position;


public Employee() {}


public Employee(String name, String email, String position) {
    super();
    this.name = name;
    this.email = email;
    this.position = position;
}


public Employee(int id, String name, String email, String position) {
    this.id = id;
    this.name = name;
    this.email = email;
    this.position = position;
}


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 getEmail() {
    return email;
}

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

public String getPosition() {
    return position;
}

public void setPosition(String position) {
    this.position = position;
```

```
    }
}
```

Coding EmployeeServlet.java

```
package com.WEB;


import com.DAO.EmployeeDAO;
import com.Model.Employee;
import jakarta.servlet.RequestDispatcher;
import java.io.IOException;
import java.io.PrintWriter;
import jakarta.servlet.ServletException;
import jakarta.servlet.annotation.WebServlet;
import jakarta.servlet.http.HttpServlet;
import jakarta.servlet.http.HttpServletRequest;
import jakarta.servlet.http.HttpServletResponse;
import java.sql.SQLException;
import java.util.List;


@WebServlet("/")
public class EmployeeServlet extends HttpServlet {


    /**
     * Processes requests for both HTTP <code>GET</code> and <code>POST</code>
     * methods.
```

```
     *
     * @param request servlet request
     * @param response servlet response
     * @throws ServletException if a servlet-specific error occurs
     * @throws IOException if an I/O error occurs
     */
    private EmployeeDAO employeeDAO;

    @Override
    public void init(){
        employeeDAO = new EmployeeDAO();
    }

    // <editor-fold defaultstate="collapsed" desc="HttpServlet methods. Click on the + sign on the left to edit the code.">
    /**
     * Handles the HTTP <code>GET</code> method.
     *
     * @param request servlet request
     * @param response servlet response
     * @throws ServletException if a servlet-specific error occurs
     * @throws IOException if an I/O error occurs
     */
    @Override
    protected void doGet(HttpServletRequest request, HttpServletResponse response)
```

```
    throws ServletException, IOException {
String action = request.getServletPath();


try{
    switch(action){
        case "/new":
            showNewForm(request, response);
            break;
        case "/insert":
            insertEmployee(request, response);
            break;
        case "/delete":
            deleteEmployee(request, response);
            break;
        case "/edit":
            showEditForm(request, response);
            break;
        case "/update":
            updateEmployee(request, response);
            break;
        default:
            listEmployee(request, response);
            break;
    }
}catch(SQLException ex){
```

```
            throw new ServletException(ex);
        }
    }

    private void listEmployee(HttpServletRequest request, HttpServletResponse response)
            throws SQLException, IOException, ServletException{
        List < Employee > listEmployee = employeeDAO.selectAllEmployees();
        request.setAttribute("listEmployee", listEmployee);
        RequestDispatcher dispatcher = request.getRequestDispatcher("EmployeeList.jsp");
        dispatcher.forward(request, response);
    }

    private void showNewForm(HttpServletRequest request, HttpServletResponse response)
            throws ServletException, IOException{
        RequestDispatcher dispatcher = request.getRequestDispatcher("EmployeeForm.jsp");
        dispatcher.forward(request, response);
    }

    private void showEditForm(HttpServletRequest request, HttpServletResponse response)
            throws SQLException, ServletException, IOException{
        int id = Integer.parseInt(request.getParameter("id"));
        Employee existingEmployee = employeeDAO.selectEmployee(id);
        RequestDispatcher dispatcher = request.getRequestDispatcher("EmployeeForm.jsp");
        request.setAttribute("employee", existingEmployee);
        dispatcher.forward(request, response);
```

```
}

private void insertEmployee(HttpServletRequest request, HttpServletResponse response)
        throws SQLException, IOException{
    String name = request.getParameter("name");
    String email = request.getParameter("email");
    String position = request.getParameter("position");
    Employee newEmployee = new Employee(name, email, position);
    employeeDAO.insertEmployee(newEmployee);
    response.sendRedirect("list");
}

private void updateEmployee(HttpServletRequest request, HttpServletResponse response)
        throws SQLException, IOException{
    int id = Integer.parseInt(request.getParameter("id"));
    String name = request.getParameter("name");
    String email = request.getParameter("email");
    String position = request.getParameter("position");

    Employee employee = new Employee(id, name, email, position);
    employeeDAO.updateEmployee(employee);
    response.sendRedirect("list");
}

private void deleteEmployee(HttpServletRequest request, HttpServletResponse response)
```

```
        throws SQLException, IOException{
    int id = Integer.parseInt(request.getParameter("id"));
    employeeDAO.deleteEmployee(id);
    response.sendRedirect("list");
}



/**
 * Handles the HTTP <code>POST</code> method.
 *
 * @param request servlet request
 * @param response servlet response
 * @throws ServletException if a servlet-specific error occurs
 * @throws IOException if an I/O error occurs
 */
@Override
protected void doPost(HttpServletRequest request, HttpServletResponse response)
        throws ServletException, IOException {
    doGet(request, response);
}


/**
 * Returns a short description of the servlet.
 *
 * @return a String containing servlet description
```

```
     */
    @Override
    public String getServletInfo() {
        return "Short description";
    }// </editor-fold>

}
```

Coding EmployeeForm.jsp

```
<%--
    Document   : EmployeeForm
    Created on : 15 Jun 2024, 2:31:56 pm
    Author     : Luqman Hakim
--%>

<%@page contentType="text/html" pageEncoding="UTF-8"%>
<%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
<!DOCTYPE html>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
        <title>Employee Management Application</title>
        <link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css"
```

```
        integrity="sha384-
ggOyR0iXCbMQv3Xipma34MD+dH/1fQ784/j6cY/iJTQUOhcWr7x9JvoRxT2MZw1T"
crossorigin="anonymous">



    <script>

      function updatePosition() {

        var selectedPosition = document.getElementById("position").value;

        document.getElementById("displayPosition").value = selectedPosition;

      }

    </script>

  </head>

  <body>

    <header>

      <nav class="navbar navbar-expand-md navbar-dark" style="background-color:
tomato">

        <div>

          <a href="" class="navbar-brand"> Employee Management App </a>

        </div>



        <ul class="navbar-nav">

          <li><a href="<%=request.getContextPath()%>/list" class="nav-
link">Employees</a></li>

        </ul>

      </nav>

    </header>

    <br>

    <div class="container col-md-5">
```

```
        <div class="card">
            <div class="card-body">
                <c:if test="${employee != null}">
                    <form action="update" method="post">
                </c:if>
                <c:if test="${employee == null}">
                    <form action="insert" method="post">
                </c:if>

                <h2>
                    <c:if test="${employee != null}">
                        Edit Employee
                    </c:if>
                    <c:if test="${employee == null}">
                        Add New Employee
                    </c:if>
                </h2>

                <c:if test="${employee != null}">
                    <input type="hidden" name="id" value="<c:out value='${employee.id}' />" />
                </c:if>

                <fieldset class="form-group">
                    <label>Employee Name</label><input type="text" value="<c:out
value='${employee.name}' />"
```

```
                                    class="form-control" name="name" required="required">
            </fieldset>

            <fieldset class="form-group">
              <label>Employee Email</label><input type="text" value="<c:out
value='${employee.email}' />"
                                    class="form-control" name="email">
            </fieldset>

            <fieldset class="form-group">
              <label>Employee Position</label>
              <input type="text" id="displayPosition" value="<c:out
value='${employee.position}' />" class="form-control" readonly>
              <input list="positionList" id="position" class="form-control" name="position"
onchange="updatePosition()" >
              <datalist id="positionList">
                <option value="Manager">
                <option value="Head of Dept">
                <option value="Supervisor">
                <option value="Director">
              </datalist>
            </fieldset>

            <button type="submit" class="btn btn-success">Save</button>
            </form>
          </div>
```

```
        </div>
      </div>
   </body>
</html>
```

Coding EmployeeList.jsp

```
<%--
   Document   : EmployeeList
   Created on : 15 Jun 2024, 2:32:11 pm
   Author     : Luqman Hakim
--%>

<%@page contentType="text/html" pageEncoding="UTF-8"%>
<%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c" %>
<!DOCTYPE html>
<html>
   <head>
      <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
      <title>Employee Management System</title>
      <link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css"
          integrity="sha384-
ggOyR0iXCbMQv3Xipma34MD+dH/1fQ784/j6cY/iJTQUOhcWr7x9JvoRxT2MZw1T"
crossorigin="anonymous">
   </head>
   <body>
```

```
<header>
  <nav class="navbar navbar-expand-md navbar-dark" style="background-color: tomato">
    <div>
      <a href="" class="navbar-brand"> Employee Management App </a>
    </div>

    <ul class="navbar-nav">
      <li><a href="<%=request.getContextPath()%>/list" class="nav-link">Employees</a></li>
    </ul>
  </nav>
</header>
<br>

<div class="row">
  <div class="container">
    <h3 class="container">List of Employees</h3>
    <hr>
    <div class="container text-left">
      <a href="<%=request.getContextPath()%>/new" class="btn btn-success">Add New Employee</a>
    </div>
    <br>
    <table class="table table-bordered">
```

```
<thead>
  <tr>
    <th>ID</th>
    <th>Name</th>
    <th>Email</th>
    <th>Position</th>
    <th>Actions</th>
  </tr>
</thead>
<tbody>
  <c:forEach var="employee" items="${listEmployee}">
    <tr>
      <td>
        <c:out value="${employee.id}" />
      </td>
      <td>
        <c:out value="${employee.name}" />
      </td>
      <td>
        <c:out value="${employee.email}" />
      </td>
      <td>
        <c:out value="${employee.position}" />
      </td>
```

```
                        <td><a href="edit?id=<c:out value='${employee.id}' />">Edit</a>
    
                            <a href="delete?id=<c:out value='${employee.id}' />">Delete</a>
                        </td>
                    </tr>
                </c:forEach>
            </tbody>
        </table>
    </div>
</div>
</body>
</html>
```

Coding error.jsp

```
<%--
    Document   : error
    Created on : 15 Jun 2024, 2:32:48 pm
    Author     : Luqman Hakim
--%>

<%@page contentType="text/html" pageEncoding="UTF-8" isErrorPage="true" %>
<!DOCTYPE html>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
```

```
        <title>Error page</title>
    </head>
    <body>
        <center>
            <h1>Error</h1>
            <h2><%=exception.getMessage() %><br/></h2>
        </center>
    </body>
</html>
```

Coding index.jsp

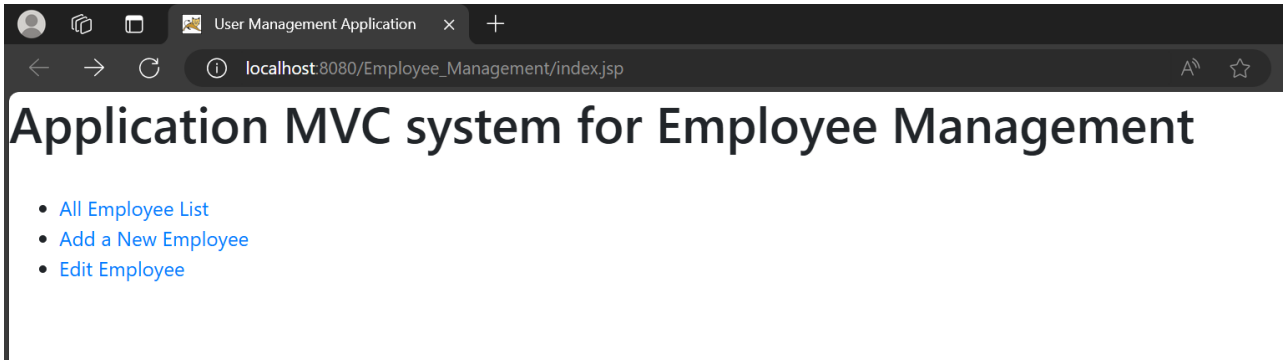
```
<%--
    Document   : index
    Created on : 15 Jun 2024, 2:32:54 pm
    Author     : Luqman Hakim
--%>

<%@page contentType="text/html" pageEncoding="UTF-8"%>
<!DOCTYPE html>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
        <title>User Management Application</title>
        <link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css"
```

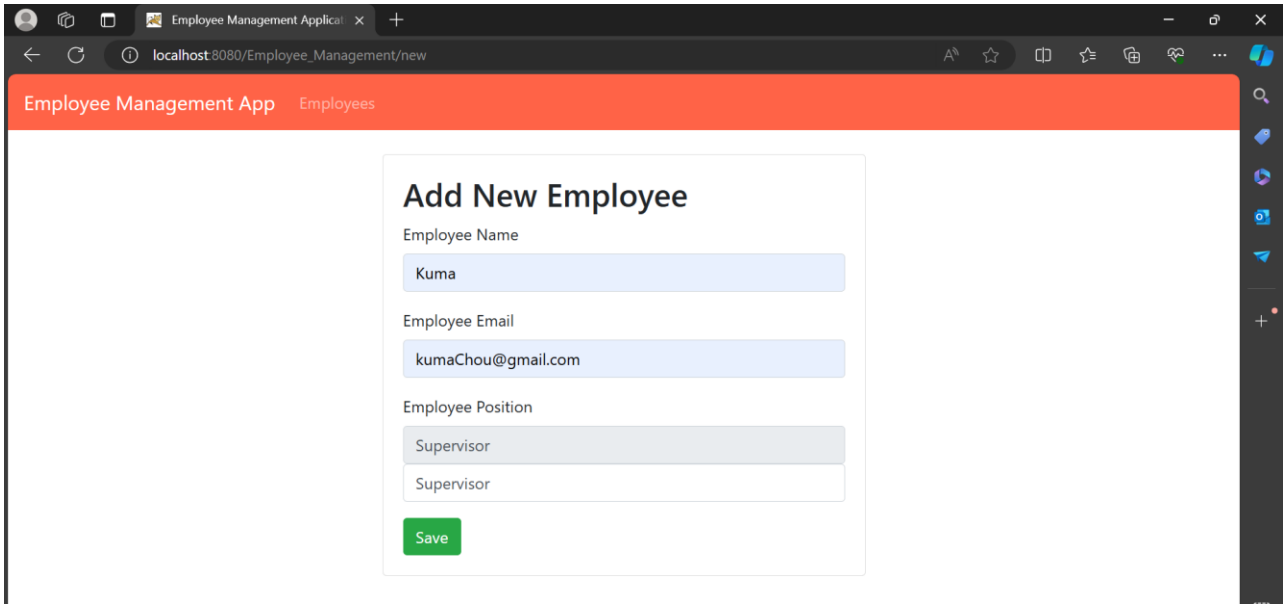
```
        integrity="sha384-
ggOyR0iXCbMQv3Xipma34MD+dH/1fQ784/j6cY/iJTQUOhcWr7x9JvoRxT2MZw1T"
crossorigin="anonymous">

  </head>

  <body>

    <h1>Application MVC system for Employee Management</h1><br>



    <ul>

      <li><a href="http://localhost:8080/Employee_Management/list">All Employee
List</a></li>

      <li><a href="http://localhost:8080/Employee_Management/new">Add a New
Employee</a></li>

      <li><a href="http://localhost:8080/Employee_Management/list">Edit
Employee</a></li>

    </ul>

  </body>

</html>
```

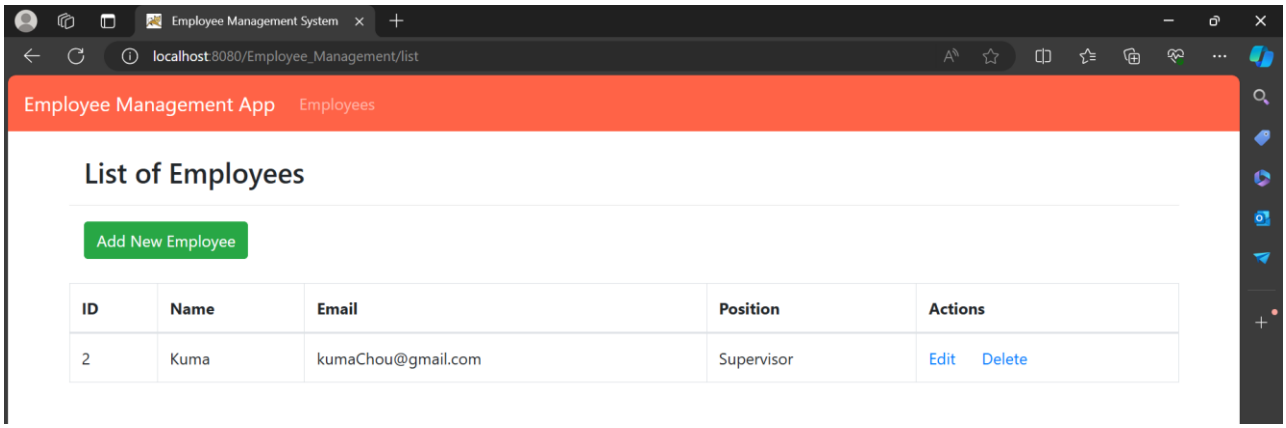
Database

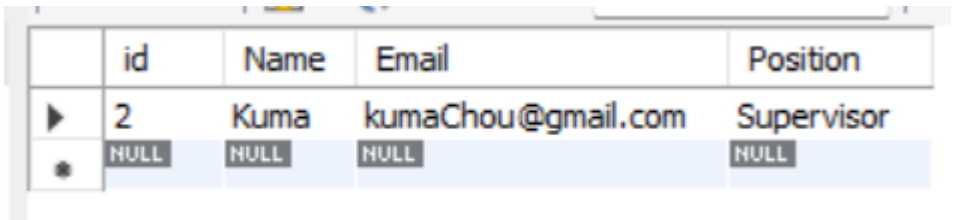
```
16  CREATE DATABASE IF NOT EXISTS Company;
17  USE Company;
18
19  CREATE TABLE IF NOT EXISTS employees (
20      id INT NOT NULL AUTO_INCREMENT,
21      Name VARCHAR(60),
22      Email VARCHAR(50),
23      Position VARCHAR(15),
24      PRIMARY KEY (id)
25  );
```

Output add new employee

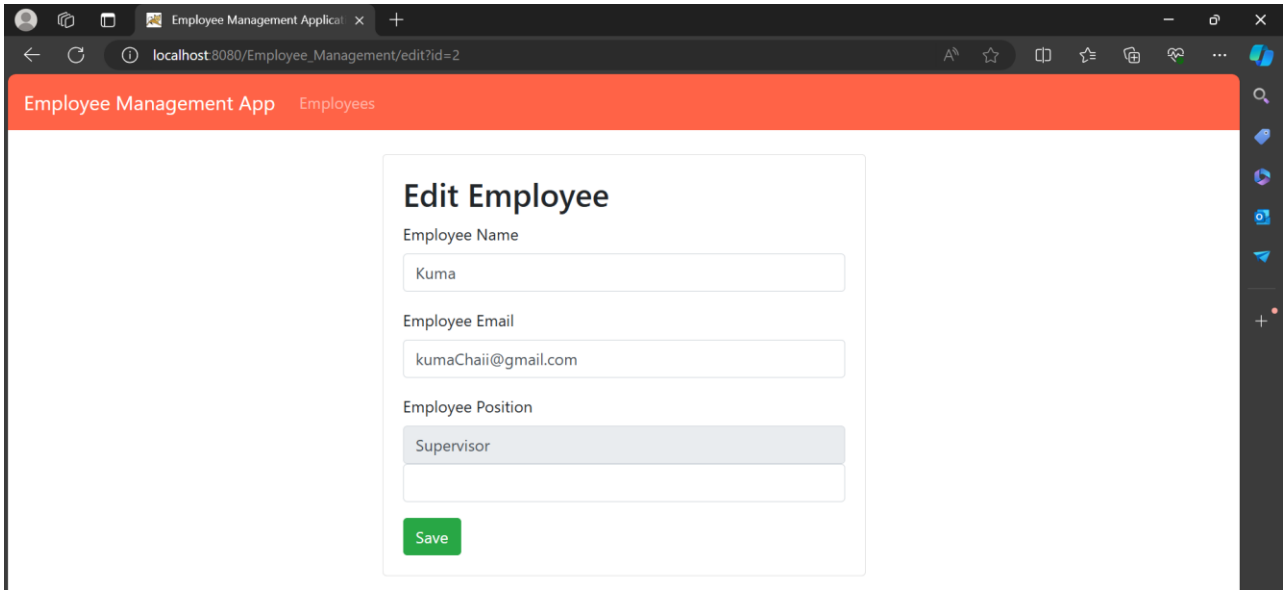


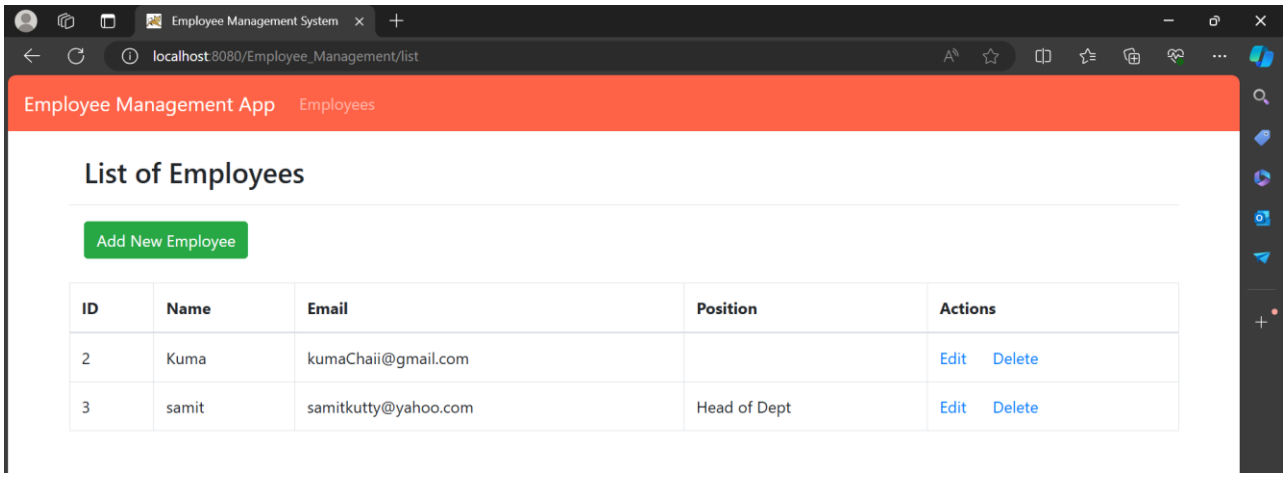


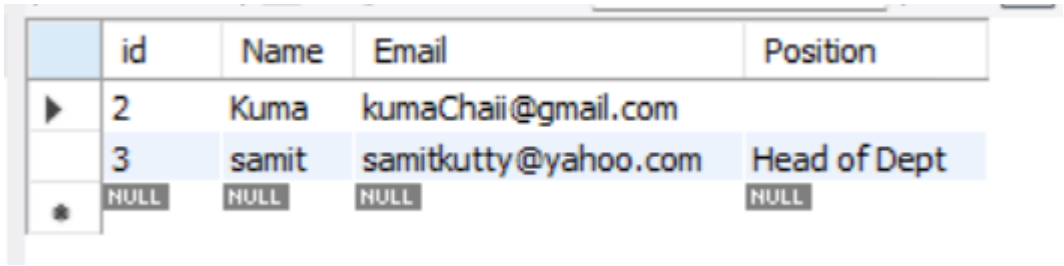




Output edit employee

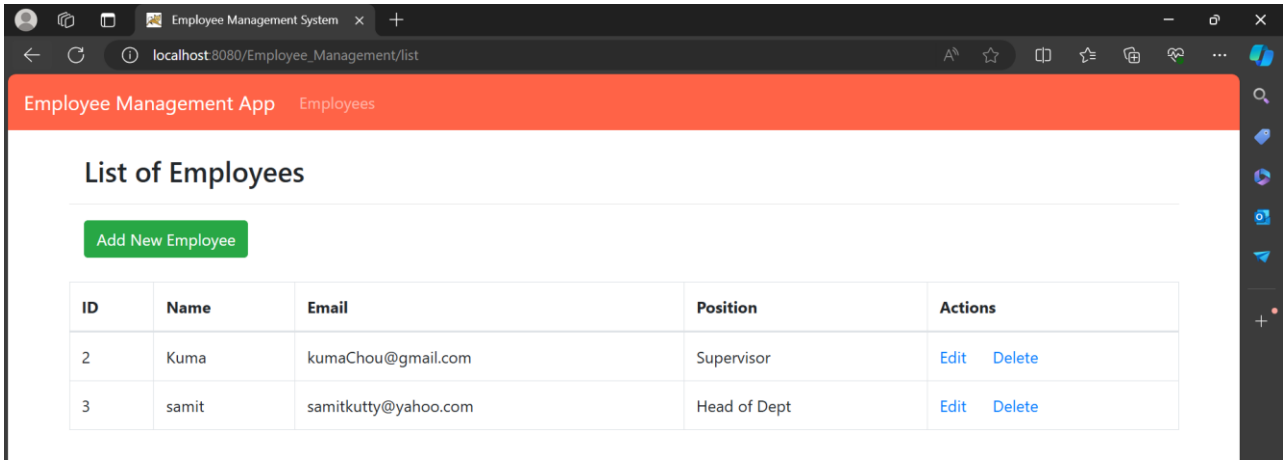


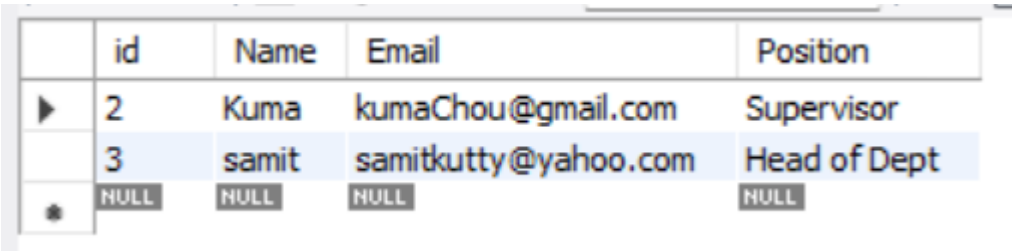




	id	Name	Email	Position
▶	2	Kuma	kumaChaii@gmail.com	
	3	samit	samitkutty@yahoo.com	Head of Dept
*	NULL	NULL	NULL	NULL

Output all employee list





	id	Name	Email	Position
▶	2	Kuma	kumaChou@gmail.com	Supervisor
	3	samit	samitkutty@yahoo.com	Head of Dept
*	NULL	NULL	NULL	NULL

Exercise

Using this database shema, please create MVC Application [CRUD] for Car Shop, using JSP, Servlet, and MySQL.

```
CREATE DATABASE if not EXISTS carshop;
USE carshop;

CREATE TABLE if not EXISTS CarPricelist(
    Car_id INT NOT NULL AUTO_INCREMENT,
    Brand VARCHAR(15),
    Model VARCHAR(30),
    Cyclinder INT,
    Price DOUBLE,
    PRIMARY KEY (Car_id)
);
```

The application should be able to handle these activities:

1. View all data
2. Add new data
3. Edit/Update current data
4. Delete the specific data

Coding CarDAO.java

```
package com.DAO;


import java.sql.*;

import java.sql.SQLException;

import java.util.*;

import com.model.Car;


public class CarDAO {

   Connection connection = null;

   private String jdbcURL = "jdbc:mysql://localhost:3306/carshop";

   private String jdbcUsername = "root";

   private String jdbcPassword = "admin";


   private static final String INSERT_CARS_SQL = "INSERT INTO carpricelist(brand, model,
cylinder, price) VALUES (?, ?, ?, ?);";

   private static final String SELECT_CAR_BY_ID = "select car_id, brand, model, cylinder, price
from carpricelist where car_id=?";

   private static final String SELECT_ALL_CARS = "select * from carpricelist";

   private static final String DELETE_CARS_SQL = "delete from carpricelist where car_id = ?;";

   private static final String UPDATE_CARS_SQL = "update carpricelist set brand = ?,model= ?,
cylinder= ?, price= ? where car_id = ?;";


   public CarDAO(){}


      protected Connection getConnection(){

         Connection connection = null;

         try{

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

            connection = DriverManager.getConnection(jdbcURL, jdbcUsername,
jdbcPassword);
```

```
            System.out.println("Database connected!");
        }catch(SQLException e){
            e.printStackTrace();
        }catch(ClassNotFoundException e){
            e.printStackTrace();
        }
        return connection;
    }

public void insertCar(Car car) throws SQLException{
    System.out.println(INSERT_CARS_SQL);
    try(Connection connection = getConnection(); PreparedStatement preparedStatement =
            connection.prepareStatement(INSERT_CARS_SQL)){
        preparedStatement.setString(1, car.getBrand());
        preparedStatement.setString(2, car.getModel());
        preparedStatement.setInt(3, car.getCylinder());
        preparedStatement.setDouble(4, car.getPrice());
        System.out.println(preparedStatement);
        preparedStatement.executeUpdate();
    }catch(SQLException e){
        printSQLException(e);
            }
}

public Car selectCar(int id){
    Car car = null;
    // Step 1: Establishing a Connection
    try(Connection connection = getConnection();
        // Step 2: Create a statement using connection
```

```
        PreparedStatement preparedStatement =
connection.prepareStatement(SELECT_CAR_BY_ID);){
        preparedStatement.setInt(1, id);
        System.out.println(preparedStatement);
        ResultSet rs = preparedStatement.executeQuery();

        while(rs.next()){
           String brand = rs.getString("brand");
           String model = rs.getString("model");
           int cylinder = rs.getInt("cylinder");
           double price = rs.getDouble("price");
           car = new Car(id, brand, model, cylinder, price);
        }
     }catch (SQLException e){
           printSQLException(e);
           }
     return car;
  }

  public List < Car > selectAllCars(){
     List <Car> cars = new ArrayList <>();
     try (Connection connection = getConnection();

        PreparedStatement preparedStatement =
connection.prepareStatement(SELECT_ALL_CARS);){
        System.out.println(preparedStatement);
        ResultSet rs = preparedStatement.executeQuery();

        while(rs.next()){
           int id = rs.getInt("car_id");
```

```
            String brand = rs.getString("brand");
            String model = rs.getString("model");
            int cylinder = rs.getInt("cylinder");
            double price = rs.getDouble("price");
            cars.add(new Car(id, brand, model, cylinder, price));
        }
    }catch(SQLException e){
        printSQLException(e);
    }
    return cars;
}

public boolean deleteCar(int id) throws SQLException{
    boolean rowDeleted;
    try(Connection connection = getConnection(); PreparedStatement statement =
            connection.prepareStatement(DELETE_CARS_SQL);){
        statement.setInt(1, id);
        rowDeleted = statement.executeUpdate() > 0;
    }
    return rowDeleted;
}

public boolean updateCar(Car car) throws SQLException{
    boolean rowUpdated;
    try(Connection connection = getConnection(); PreparedStatement statement =
            connection.prepareStatement(UPDATE_CARS_SQL);){
        statement.setString(1, car.getBrand());
        statement.setString(2, car.getModel());
        statement.setInt(3, car.getCylinder());
        statement.setDouble(4, car.getPrice());
```

```
            statement.setInt(5, car.getCar_id());


            rowUpdated = statement.executeUpdate() > 0;
        }
        return rowUpdated;
    }

    private void printSQLException(SQLException ex){
        for(Throwable e: ex){
            if(e instanceof SQLException){
                e.printStackTrace(System.err);
                System.err.println("SQLState: " + ((SQLException) e).getSQLState());
                System.err.println("Error Code: " + ((SQLException) e).getErrorCode());
                System.err.println("Message: " + e.getMessage());
                Throwable t = ex.getCause();
                while(t != null){
                    System.out.println("Cause: " + t);
                    t = t.getCause();
                }
            }
        }
    }

}
```

Coding CarServlet.java

```
package com.controller;


import com.DAO.CarDAO;
```

```
import com.model.Car;
import jakarta.servlet.RequestDispatcher;
import java.io.IOException;
import java.io.PrintWriter;
import jakarta.servlet.ServletException;
import jakarta.servlet.annotation.WebServlet;
import jakarta.servlet.http.HttpServlet;
import jakarta.servlet.http.HttpServletRequest;
import jakarta.servlet.http.HttpServletResponse;
import java.sql.SQLException;
import java.util.List;

@WebServlet("/")
public class CarServlet extends HttpServlet {

    /**
     * Processes requests for both HTTP <code>GET</code> and <code>POST</code>
     * methods.
     *
     * @param request servlet request
     * @param response servlet response
     * @throws ServletException if a servlet-specific error occurs
     * @throws IOException if an I/O error occurs
     */
    private CarDAO carDAO;

    @Override
    public void init(){
        carDAO = new CarDAO();
    }
```

```
    // <editor-fold defaultstate="collapsed" desc="HttpServlet methods. Click on the + sign on the left to edit the code.">
    /**
     * Handles the HTTP <code>GET</code> method.
     *
     * @param request servlet request
     * @param response servlet response
     * @throws ServletException if a servlet-specific error occurs
     * @throws IOException if an I/O error occurs
     */
    @Override
    protected void doGet(HttpServletRequest request, HttpServletResponse response)
            throws ServletException, IOException {
        String action = request.getServletPath();

        try{
            switch(action){
                case "/new":
                    showNewForm(request, response);
                    break;
                case "/insert":
                    insertCar(request, response);
                    break;
                case "/delete":
                    deleteCar(request, response);
                    break;
                case "/edit":
                    showEditForm(request, response);
                    break;
```

```
            case "/update":
                updateCar(request, response);
                break;
            default:
                listCar(request, response);
                break;
        }
    }catch(SQLException ex){
        throw new ServletException(ex);
    }
}

private void listCar(HttpServletRequest request, HttpServletResponse response)
        throws SQLException, IOException, ServletException{
    List < Car > listCar = carDAO.selectAllCars();
    request.setAttribute("listCar", listCar);
    RequestDispatcher dispatcher = request.getRequestDispatcher("CarList.jsp");
    dispatcher.forward(request, response);
}

private void showNewForm(HttpServletRequest request, HttpServletResponse response)
        throws ServletException, IOException{
    RequestDispatcher dispatcher = request.getRequestDispatcher("CarForm.jsp");
    dispatcher.forward(request, response);
}

private void showEditForm(HttpServletRequest request, HttpServletResponse response)
        throws SQLException, ServletException, IOException{
    int id = Integer.parseInt(request.getParameter("car_id"));
    Car existingCar = carDAO.selectCar(id);
```

```
    RequestDispatcher dispatcher = request.getRequestDispatcher("CarForm.jsp");
    request.setAttribute("car", existingCar);
    dispatcher.forward(request, response);
}

private void insertCar(HttpServletRequest request, HttpServletResponse response)
        throws SQLException, IOException{
    String brand = request.getParameter("brand");
    String model = request.getParameter("model");
    int cylinder = Integer.parseInt(request.getParameter("cylinder"));
    double price = Double.parseDouble(request.getParameter("price"));
    Car car = new Car(brand, model, cylinder, price);
    carDAO.insertCar(car);
    response.sendRedirect("listcar");
}

private void updateCar(HttpServletRequest request, HttpServletResponse response)
        throws SQLException, IOException{
    int id = Integer.parseInt(request.getParameter("car_id"));
    String brand = request.getParameter("brand");
    String model = request.getParameter("model");
    int cylinder = Integer.parseInt(request.getParameter("cylinder"));
    double price = Double.parseDouble(request.getParameter("price"));
    Car car = new Car(brand, model, cylinder, price);
    carDAO.updateCar(car);
    response.sendRedirect("listcar");
}

private void deleteCar(HttpServletRequest request, HttpServletResponse response)
        throws SQLException, IOException{
```

```
    int id = Integer.parseInt(request.getParameter("car_id"));
    carDAO.deleteCar(id);
    response.sendRedirect("listcar");
}



/**
 * Handles the HTTP <code>POST</code> method.
 *
 * @param request servlet request
 * @param response servlet response
 * @throws ServletException if a servlet-specific error occurs
 * @throws IOException if an I/O error occurs
 */
@Override
protected void doPost(HttpServletRequest request, HttpServletResponse response)
        throws ServletException, IOException {
    doGet(request, response);
}

/**
 * Returns a short description of the servlet.
 *
 * @return a String containing servlet description
 */
@Override
public String getServletInfo() {
    return "Short description";
}// </editor-fold>
```

```
}
```

Coding Car.java

```
package com.model;


public class Car {
   protected int car_id;
   protected String brand;
   protected String model;
   protected int cylinder;
   protected double price;

   public Car(){}

   public Car(String brand, String model, int cylinder, double price) {
      super();
      this.brand = brand;
      this.model = model;
      this.cylinder = cylinder;
      this.price = price;
   }

   public Car(int car_id, String brand, String model, int cylinder, double price) {
      this.car_id = car_id;
      this.brand = brand;
      this.model = model;
      this.cylinder = cylinder;
      this.price = price;
   }
```

```
public int getCar_id() {
    return car_id;
}

public void setCar_id(int car_id) {
    this.car_id = car_id;
}

public String getBrand() {
    return brand;
}

public void setBrand(String brand) {
    this.brand = brand;
}

public String getModel() {
    return model;
}

public void setModel(String model) {
    this.model = model;
}

public int getCylinder() {
    return cylinder;
}

public void setCylinder(int cylinder) {
    this.cylinder = cylinder;
```

```
    }

    public double getPrice() {
        return price;
    }

    public void setPrice(double price) {
        this.price = price;
    }
}
```

Coding CarForm.jsp

```
<%--
    Document   : CarForm
    Created on : 15 Jun 2024, 3:08:43 pm
    Author     : Luqman Hakim
--%>

<%@page contentType="text/html" pageEncoding="UTF-8"%>
<%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
<!DOCTYPE html>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
        <title>Car Shop Management Application</title>
        <link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css"
            integrity="sha384-
ggOyR0iXCbMQv3Xipma34MD+dH/1fQ784/j6cY/iJTQUOhcWr7x9JvoRxT2MZw1T"
crossorigin="anonymous">
```

```
    <script>
        function updateBrand() {
            var selectedBrand = document.getElementById("brand").value;
            document.getElementById("displayBrand").value = selectedBrand;
        }
    </script>
</head>
<body>
    <header>
        <nav class="navbar navbar-expand-md navbar-dark" style="background-color: tomato">
            <div>
                <a href="" class="navbar-brand"> Car Management Application </a>
            </div>

            <ul class="navbar-nav">
                <li><a href="<%=request.getContextPath()%>/listcar" class="nav-link">Cars</a></li>
            </ul>
        </nav>
    </header>
    <br>
    <div class="container col-md-5">
        <div class="card">
            <div class="card-body">
                <c:if test="${car != null}">
                    <form action="update" method="post">
                </c:if>
                <c:if test="${car == null}">
```

```
    <form action="insert" method="post">
</c:if>

<h2>
  <c:if test="${car != null}">
     Edit Car
   </c:if>
   <c:if test="${car == null}">
     Add New Car
   </c:if>
</h2>

<c:if test="${car != null}">
   <input type="hidden" name="car_id" value="<c:out value='${car.id}' />" />
</c:if>

<fieldset class="form-group">
   <label>Car Brand</label>
   <input type="text" id="displayBrand" value="<c:out value='${car.brand}' />"
class="form-control" readonly>
   <input list="carList" id="brand" class="form-control" name="brand"
onchange="updateBrand()" >
   <datalist id="carList">
      <option value="Proton">
      <option value="Perodua">
      <option value="Toyota">
      <option value="Honda">
      <option value="Nissan">
      <option value="Ford">
      <option value="Hyundai">
```

```
                    <option value="Kia">
                  </datalist>
                </fieldset>

                <fieldset class="form-group">
                  <label>Car Model</label><input type="text" value="<c:out
value='${car.model}' />"
                                        class="form-control" name="model" required="required">
                </fieldset>

                <fieldset class="form-group">
                  <label>Engine Cylinder</label><input type="text" value="<c:out
value='${car.cylinder}' />"
                                        class="form-control" name="cylinder">
                </fieldset>

                <fieldset class="form-group">
                  <label>Car Price</label><input type="text" value="<c:out value='${car.price}'
/>"
                                        class="form-control" name="price">
                </fieldset>

                <button type="submit" class="btn btn-success">Save</button>
                </form>
              </div>
            </div>
          </div>
        </body>
</html>
```

Coding CarList.jsp

```
<%--
    Document   : CarList
    Created on : 15 Jun 2024, 3:08:51 pm
    Author     : Luqman Hakim
--%>

<%@page contentType="text/html" pageEncoding="UTF-8"%>
<%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c" %>
<!DOCTYPE html>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
        <title>Car Shop Management Application</title>
        <link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css"
              integrity="sha384-
ggOyR0iXCbMQv3Xipma34MD+dH/1fQ784/j6cY/iJTQUOhcWr7x9JvoRxT2MZw1T"
crossorigin="anonymous">
    </head>
    <body>

        <header>
            <nav class="navbar navbar-expand-md navbar-dark" style="background-color:
tomato">
                <div>
                    <a href="" class="navbar-brand"> Car Shop Management App </a>
                </div>

                <ul class="navbar-nav">
```

```
            <li><a href="<%=request.getContextPath()%>/listcar" class="nav-
link">Cars</a></li>
          </ul>
        </nav>
      </header>
      <br>

      <div class="row">
        <div class="container">
          <h3 class="container">List of Cars</h3>
          <hr>
          <div class="container text-left">
            <a href="<%=request.getContextPath()%>/new" class="btn btn-success">Add
New Car</a>
          </div>
          <br>
          <table class="table table-bordered">
            <thead>
              <tr>
                <th>ID</th>
                <th>Brand</th>
                <th>Model</th>
                <th>Engine Cylinder</th>
                <th>Price</th>
                <th>Actions</th>
              </tr>
            </thead>
            <tbody>
              <c:forEach var="car" items="${listCar}">
                <tr>
```

```
                        <td>
                            <c:out value="${car.car_id}" />
                        </td>
                        <td>
                            <c:out value="${car.brand}" />
                        </td>
                        <td>
                            <c:out value="${car.model}" />
                        </td>
                        <td>
                            <c:out value="${car.cylinder}" />
                        </td>
                        <td>
                            <c:out value="${car.price}" />
                        </td>
                        <td><a href="edit?car_id=<c:out value='${car.car_id}' />">Edit</a>
    
                            <a href="delete?car_id=<c:out value='${car.car_id}' />">Delete</a>
                        </td>
                    </tr>
                </c:forEach>
            </tbody>
        </table>
    </div>
</div>
</body>
</html>
```

Coding error.jsp

```
<%--
    Document   : error
    Created on : 15 Jun 2024, 3:08:58 pm
    Author     : Luqman Hakim
--%>

<%@page contentType="text/html" pageEncoding="UTF-8" isErrorPage="true" %>
<!DOCTYPE html>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
        <title>Error page</title>
    </head>
    <body>
        <center>
            <h1>Error</h1>
            <h2><%=exception.getMessage() %><br/></h2>
        </center>
    </body>
</html>
```

Coding index.jsp

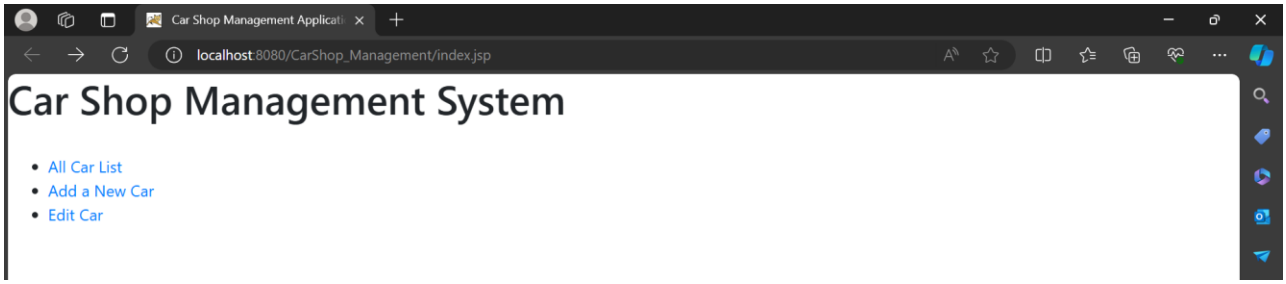
```
<%--
    Document   : index
    Created on : 15 Jun 2024, 3:09:13 pm
    Author     : Luqman Hakim
--%>
```

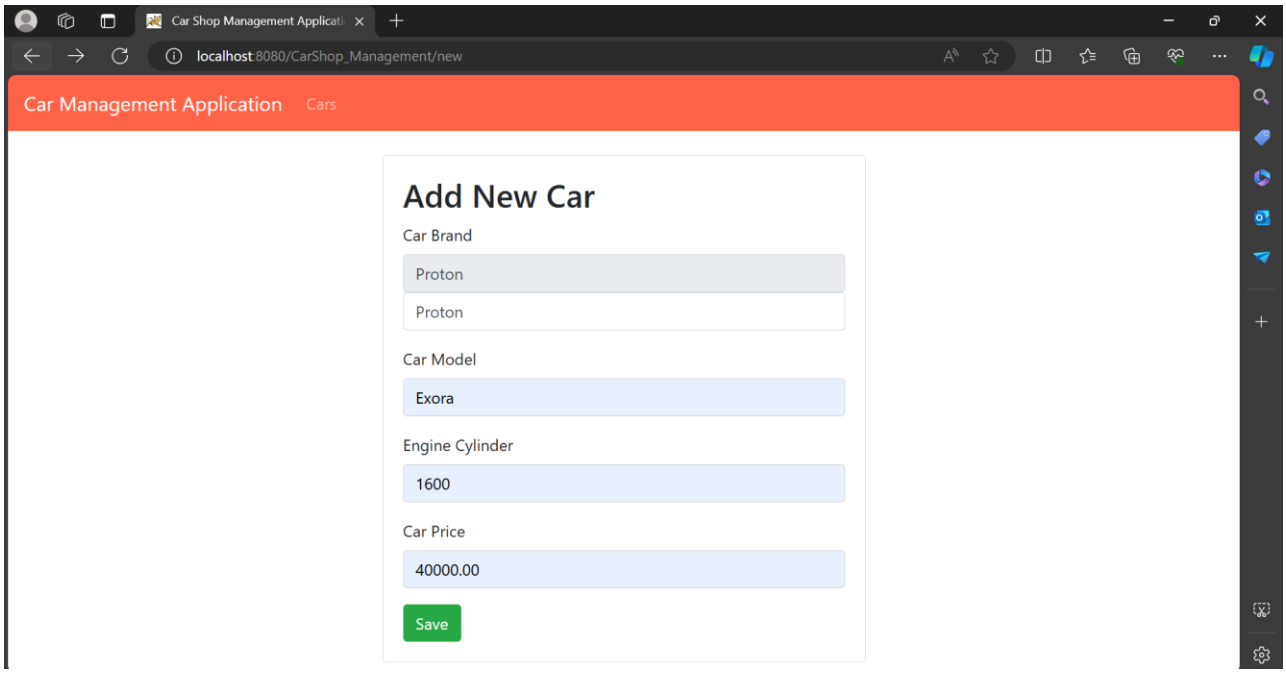
```
<%@page contentType="text/html" pageEncoding="UTF-8"%>

<!DOCTYPE html>

<html>

  <head>

    <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">

    <title>Car Shop Management Application</title>

    <link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css"

        integrity="sha384-
ggOyR0iXCbMQv3Xipma34MD+dH/1fQ784/j6cY/iJTQUOhcWr7x9JvoRxT2MZw1T"
crossorigin="anonymous">

  </head>

  <body>

    <h1>Car Shop Management System</h1><br>


    <ul>

      <li><a href="http://localhost:8080/CarShop_Management/listcar">All Car
List</a></li>

      <li><a href="http://localhost:8080/CarShop_Management/new">Add a New
Car</a></li>

      <li><a href="http://localhost:8080/CarShop_Management/listcar">Edit Car</a></li>

    </ul>

  </body>

</html>
```

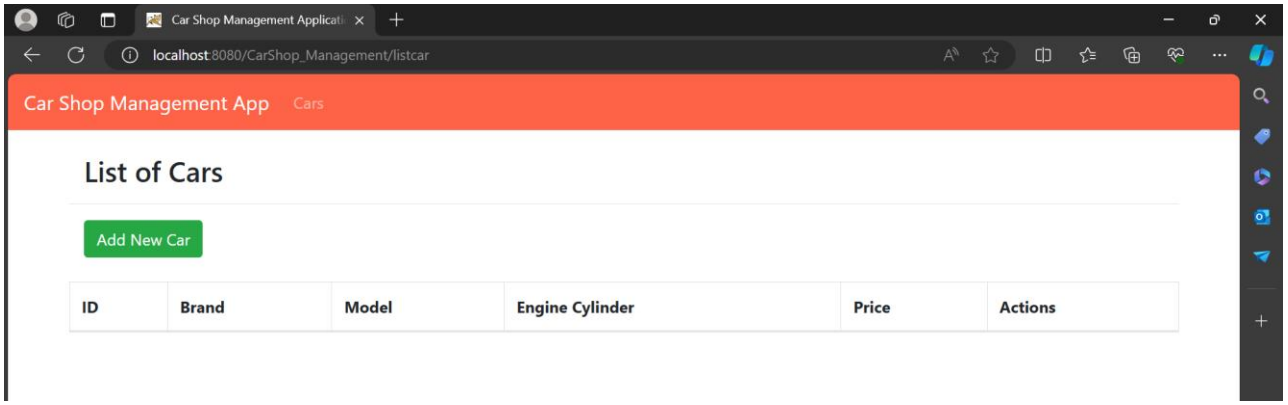
Database

```
27    CREATE DATABASE if not EXISTS carshop;
28    USE carshop;
29
30    CREATE TABLE if not EXISTS CarPricelist(
31        Car_id INT NOT NULL AUTO_INCREMENT,
32        Brand VARCHAR(15),
33        Model VARCHAR(30),
34        Cyclinder INT,
35        Price DOUBLE,
36        PRIMARY KEY (Car_id)
37    );
```

Output






Car Shop Management Applicati
localhost:8080/CarShop_Management/listcar
Car Shop Management App
Cars
List of Cars
Add New Car
ID
Brand
Model
Engine Cylinder
Price
Actions