

# Rajalakshmi Engineering College

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## 2024\_28\_III\_OOPS Using Java Lab

### REC\_2028\_OOPS using Java\_Week 11

Attempt : 1  
Total Mark : 20  
Marks Obtained : 20

#### **Section 1 : Project**

##### **1. Problem Statement**

In ABC Corporation, employee records are stored in a database.

To efficiently manage employee details using Java and JDBC, you are tasked with building an Employee Management System that supports the following functionalities:

Adding a new employee

Updating an employee's salary

Viewing an employee's details

Displaying all employees

You are given two files:

## File 1: Employee.java (POJO Class)

This class represents the Employee entity.

An Employee contains the following details:

### Field Description

employeeId Unique Employee ID (Integer)

name Employee Name (String)

department Employee Department (String)

salary Employee Salary (Double)

Students must write code in the marked area:

```
class Employee {  
    private int employeeId;  
    private String name;  
    private String department;  
    private double salary;  
  
    public Employee() {}  
  
    public Employee(int employeeId, String name, String department, double  
    salary) {  
        // write your code here  
    }  
  
    // Include getters and setters  
}
```

Expected in this part:

Assign parameter values to instance variables inside the constructor.

Add getters and setters for all attributes.

File 2: EmployeeDAO.java (Data Access Layer)

This class handles all database operations using JDBC.

Students must complete the missing JDBC logic in the following methods:

```
class EmployeeDAO {  
  
    public void addEmployee(Connection conn, Employee employee) throws  
SQLException {  
        // write your code here  
    }  
  
    public void updateSalary(Connection conn, int employeeId, double  
newSalary) throws SQLException {  
        // write your code here  
    }  
  
    public void deleteEmployee(Connection conn, int employeeId) throws  
SQLException {  
        // write your code here  
    }  
  
    public Employee viewEmployeeRecord(Connection conn, int employeeId)  
throws SQLException {  
        // write your code here  
    }  
  
    public List<Employee> displayAllEmployees(Connection conn) throws  
SQLException {  
        // write your code here  
    }  
}
```

```
private Employee mapToEmployee(ResultSet rs) throws SQLException {  
    return new Employee(  
        // write your code here  
    );  
}  
}
```

Expected in this part:

Write SQL queries for INSERT, UPDATE, DELETE, SELECT.

Execute queries using PreparedStatement or Statement.

Map ResultSet rows to Employee objects using mapToEmployee().

Return a List<Employee> where required.

The system should connect to a MySQL database using the following default credentials:

DB URL: jdbc:mysql://localhost/ri\_db  
Username: test  
Password: test123

The employees table has already been created with the following structure:

#### ***Input Format***

The first line of input consists of an integer choice, representing the operation to be performed:

(1 for Add Employee, 2 for Update Salary, 3 for View Employee Record, 4 for Display All Employees, 5 for Exit)

For choice 1 (Add Employee):

1. The second line consists of an integer employee\_id.
2. The third line consists of a string name.
3. The fourth line consists of a string department.
4. The fifth line consists of a double salary (must be at least 30000).

For choice 2 (Update Salary):

1. The second line consists of an integer employee\_id.
2. The third line consists of a double new\_salary (must be at least 30000).

For choice 3 (View Employee Record):

1. The second line consists of an integer employee\_id.

For choice 4 (Display All Employees).

For choice 5 (Exit).

***Output Format***

For choice 1 (Add Employee),

1. Print "Employee added successfully" if the employee was added.

For choice 2 (Update Salary),

1. Print "Salary updated successfully" if the salary update was successful.
2. Print "Employee not found." if the specified employee ID does not exist.
3. Print "Salary must be at least 30000." if the provided salary is below the minimum.

For choice 3 (View Employee Record),

1. Display the employee details in the format:
2. ID: [employee\_id] | Name: [name] | Department: [department] | Salary: [salary]
3. Print "Employee not found." if the specified employee ID does not exist.

For choice 4 (Display All Employees),

1. Display each employee on a new line in the format:
2. ID | Name | Department | Salary

For choice 5 (Exit),

1. Print "Exiting Employee Management System."

For invalid input:

1. Print "Invalid choice. Please try again."

#### **Sample Test Case**

Input: 1

101

Alice Johnson

Engineering

31000.75

4

6

5

Output: Employee added successfully

ID | Name | Department | Salary

101 | Alice Johnson | Engineering | 31000.75

Invalid choice. Please try again.

Exiting Employee Management System.

#### **Answer**

```
import java.sql.*;  
import java.util.Scanner;  
  
import java.sql.*;  
import java.util.ArrayList;  
import java.util.List;  
import java.util.Scanner;  
  
// Employee POJO Class
```

```
class Employee {  
    private int employeeId;  
    private String name;  
    private String department;  
    private double salary;  
  
    public Employee() {}  
  
    public Employee(int employeeId, String name, String department, double  
salary) {  
        this.employeeId = employeeId;  
        this.name = name;  
        this.department = department;  
        this.salary = salary;  
    }  
  
    // Getters  
    public int getEmployeeId() {  
        return employeeId;  
    }  
  
    public String getName() {  
        return name;  
    }  
  
    public String getDepartment() {  
        return department;  
    }  
  
    public double getSalary() {  
        return salary;  
    }  
  
    // Setters  
    public void setEmployeeId(int employeeId) {  
        this.employeeId = employeeId;  
    }  
  
    public void setName(String name) {  
        this.name = name;  
    }  
}
```

```
public void setDepartment(String department) {
    this.department = department;
}

public void setSalary(double salary) {
    this.salary = salary;
}
}

// Data Access Object Class
class EmployeeDAO {

    public void addEmployee(Connection conn, Employee employee) throws
SQLException {
        String sql = "INSERT INTO employees (employee_id, name, department,
salary) VALUES (?, ?, ?, ?)";
        try (PreparedStatement pstmt = conn.prepareStatement(sql)) {
            pstmt.setInt(1, employee.getEmployeeId());
            pstmt.setString(2, employee.getName());
            pstmt.setString(3, employee.getDepartment());
            pstmt.setDouble(4, employee.getSalary());
            pstmt.executeUpdate();
        }
    }

    public void updateSalary(Connection conn, int employeeId, double newSalary)
throws SQLException {
        String sql = "UPDATE employees SET salary = ? WHERE employee_id = ?";
        try (PreparedStatement pstmt = conn.prepareStatement(sql)) {
            pstmt.setDouble(1, newSalary);
            pstmt.setInt(2, employeeId);
            pstmt.executeUpdate();
        }
    }

    public void deleteEmployee(Connection conn, int employeeId) throws
SQLException {
        String sql = "DELETE FROM employees WHERE employee_id = ?";
        try (PreparedStatement pstmt = conn.prepareStatement(sql)) {
            pstmt.setInt(1, employeeId);
            pstmt.executeUpdate();
        }
    }
}
```

```
    }

    public Employee viewEmployeeRecord(Connection conn, int employeeId)
throws SQLException {
    String sql = "SELECT * FROM employees WHERE employee_id = ?";
    try (PreparedStatement pstmt = conn.prepareStatement(sql)) {
        pstmt.setInt(1, employeeId);
        try (ResultSet rs = pstmt.executeQuery()) {
            if (rs.next()) {
                return mapToEmployee(rs);
            }
        }
    }
    return null;
}

public List<Employee> displayAllEmployees(Connection conn) throws
SQLException {
    List<Employee> employees = new ArrayList<>();
    String sql = "SELECT * FROM employees";
    try (Statement stmt = conn.createStatement()) {
        ResultSet rs = stmt.executeQuery(sql));
        while (rs.next()) {
            employees.add(mapToEmployee(rs));
        }
    }
    return employees;
}

private Employee mapToEmployee(ResultSet rs) throws SQLException {
    return new Employee(
        rs.getInt("employee_id"),
        rs.getString("name"),
        rs.getString("department"),
        rs.getDouble("salary")
    );
}
}

// Main Application Class
class EmployeeManagementSystem {
```

```
private static final double MIN_SALARY = 30000.0;

public static void addEmployee(Connection conn, Scanner scanner) {
    try {
        int employeeId = scanner.nextInt();
        scanner.nextLine(); // consume newline
        String name = scanner.nextLine();
        String department = scanner.nextLine();
        double salary = scanner.nextDouble();

        if (salary < MIN_SALARY) {
            System.out.println("Salary must be at least 30000.");
            return;
        }

        Employee employee = new Employee(employeeId, name, department,
                                         salary);
        EmployeeDAO dao = new EmployeeDAO();
        dao.addEmployee(conn, employee);
        System.out.println("Employee added successfully");
    } catch (SQLException e) {
        System.out.println("Error adding employee: " + e.getMessage());
    }
}

public static void updateSalary(Connection conn, Scanner scanner) {
    try {
        int employeeId = scanner.nextInt();
        double newSalary = scanner.nextDouble();

        if (newSalary < MIN_SALARY) {
            System.out.println("Salary must be at least 30000.");
            return;
        }

        EmployeeDAO dao = new EmployeeDAO();
        Employee employee = dao.viewEmployeeRecord(conn, employeeId);

        if (employee == null) {
            System.out.println("Employee not found.");
            return;
        }
    }
}
```

```
        dao.updateSalary(conn, employeeId, newSalary);
        System.out.println("Salary updated successfully");
    } catch (SQLException e) {
        System.out.println("Error updating salary: " + e.getMessage());
    }
}

public static void viewEmployeeRecord(Connection conn, Scanner scanner) {
    try {
        int employeeId = scanner.nextInt();
        EmployeeDAO dao = new EmployeeDAO();
        Employee employee = dao.viewEmployeeRecord(conn, employeeId);

        if (employee == null) {
            System.out.println("Employee not found.");
        } else {
            System.out.printf("ID: %d | Name: %s | Department: %s | Salary: %.2f%n",
                employee.getEmployeeId(), employee.getName(),
                employee.getDepartment(), employee.getSalary());
        }
    } catch (SQLException e) {
        System.out.println("Error viewing employee: " + e.getMessage());
    }
}

public static void displayAllEmployees(Connection conn) {
    try {
        EmployeeDAO dao = new EmployeeDAO();
        List<Employee> employees = dao.displayAllEmployees(conn);

        System.out.println("ID | Name | Department | Salary");
        for (Employee emp : employees) {
            System.out.printf("%d | %s | %s | %.2f%n",
                emp.getEmployeeId(), emp.getName(),
                emp.getDepartment(), emp.getSalary());
        }
    } catch (SQLException e) {
        System.out.println("Error displaying employees: " + e.getMessage());
    }
}

public static void main(String[] args) {
```

```

String url = "jdbc:mysql://localhost/ri_db";
String username = "test";
String password = "test123";

try (Connection conn = DriverManager.getConnection(url, username,
password);
Scanner scanner = new Scanner(System.in)) {

    int choice;
    do {
        choice = scanner.nextInt();

        switch (choice) {
            case 1 -> addEmployee(conn, scanner);
            case 2 -> updateSalary(conn, scanner);
            case 3 -> viewEmployeeRecord(conn, scanner);
            case 4 -> displayAllEmployees(conn);
            case 5 -> System.out.println("Exiting Employee Management
System.");
            default -> System.out.println("Invalid choice. Please try again.");
        }
    } while (choice != 5);

} catch (SQLException e) {
    System.out.println("Database Error: " + e.getMessage());
}
}

```

**Status : Correct**

**Marks : 10/10**

## 2. Problem Statement

Create a JDBC-based School Management System that handles runtime input to manage student records. The system should allow users to:

Add a new student (student ID, name, grade level, GPA).

Update a student's GPA, ensuring the GPA value is within the valid range (0.0 - 4.0).

View a specific student's record by student ID.

Display all students in the database.

Exit the application.

The system should connect to a MySQL database using the following default credentials:

DB URL: jdbc:mysql://localhost/ri\_db

USER: test

PWD: test123

The students table has already been created with the following structure:

Table Name: students

#### ***Input Format***

The first line of input consists of an integer choice, representing the operation to be performed:

(1 for Add Student, 2 for Update GPA, 3 for View Student Record, 4 for Display All Students, 5 for Exit)

For choice 1 (Add Student):

- The second line consists of an integer student\_id.
- The third line consists of a string name.
- The fourth line consists of a string grade\_level.
- The fifth line consists of a double gpa (must be between 0.0 and 4.0).

For choice 2 (Update GPA):

- The second line consists of an integer student\_id.
- The third line consists of a double new\_gpa (must be between 0.0 and 4.0).

For choice 3 (View Student Record):

- The second line consists of an integer student\_id.

For choice 4 (Display All Students):

- No additional inputs are required.

For choice 5 (Exit):

- No additional inputs are required.

### ***Output Format***

The output displays:

For choice 1 (Add Student):

- Print "Student added successfully" if the student was added.
- Print "Failed to add student." if the insertion failed.

For choice 2 (Update GPA):

- Print "GPA updated successfully" if the GPA update was successful.
- Print "Student not found." if the specified student ID does not exist.
- Print "GPA must be between 0.0 and 4.0." if the provided GPA is out of the valid range.

For choice 3 (View Student Record):

- Display the student details in the format:  
ID: [student\_id] | Name: [name] | Grade Level: [grade\_level] | GPA: [gpa]
- Print "Student not found." if the specified student ID does not exist.

For choice 4 (Display All Students):

- Display each student on a new line in the format:  
ID | Name | Grade Level | GPA
- If there are no records, print nothing (or handle with an appropriate message if desired).

For choice 5 (Exit):

- Print "Exiting School Management System."

For invalid input:

- Print "Invalid choice. Please try again."

### **Sample Test Case**

Input: 1

101

Alice Johnson

10

3.8

5

Output: Student added successfully

Exiting School Management System.

### **Answer**

```
import java.sql.*;
import java.util.Scanner;

class SchoolManagementSystem {
    public static void main(String[] args) {
        try (Connection conn = DriverManager.getConnection("jdbc:mysql://
localhost/ri_db", "test", "test123");
        Scanner scanner = new Scanner(System.in)) {

            boolean running = true;

            while (running) {

                int choice = scanner.nextInt();

                switch (choice) {
                    case 1:
                        addStudent(conn, scanner);
                        break;
                    case 2:
                        updateGrades(conn, scanner);
                        break;
                    case 3:
                        viewStudentRecord(conn, scanner);
                        break;
                    case 4:
                        displayAllStudents(conn);
                        break;
                }
            }
        }
    }
}
```

```
        case 5:
            System.out.println("Exiting School Management System.");
            running = false;
            break;
        default:
            System.out.println("Invalid choice. Please try again.");
    }
}
} catch (SQLException e) {
    e.printStackTrace();
}
}

public static void addStudent(Connection conn, Scanner scanner) {
try {
    int studentId = scanner.nextInt();
    scanner.nextLine(); // consume newline
    String name = scanner.nextLine();
    String gradeLevel = scanner.nextLine();
    double gpa = scanner.nextDouble();
    scanner.nextLine(); // consume newline

    String sql = "INSERT INTO students (student_id, name, grade_level, gpa)
VALUES (?, ?, ?, ?)";
    PreparedStatement pstmt = conn.prepareStatement(sql);
    pstmt.setInt(1, studentId);
    pstmt.setString(2, name);
    pstmt.setString(3, gradeLevel);
    pstmt.setDouble(4, gpa);

    int rowsAffected = pstmt.executeUpdate();
    if (rowsAffected > 0) {
        System.out.println("Student added successfully");
    } else {
        System.out.println("Failed to add student.");
    }
    pstmt.close();
} catch (SQLException e) {
    System.out.println("Failed to add student.");
}
}
```

```
public static void updateGrades(Connection conn, Scanner scanner) {
    try {
        int studentId = scanner.nextInt();
        double newGpa = scanner.nextDouble();
        scanner.nextLine(); // consume newline

        // Validate GPA range
        if (newGpa < 0.0 || newGpa > 4.0) {
            System.out.println("GPA must be between 0.0 and 4.0.");
            return;
        }

        // Check if student exists
        String checkSql = "SELECT student_id FROM students WHERE student_id
                           = ?";
        PreparedStatement checkStmt = conn.prepareStatement(checkSql);
        checkStmt.setInt(1, studentId);
        ResultSet rs = checkStmt.executeQuery();

        if (!rs.next()) {
            System.out.println("Student not found.");
            rs.close();
            checkStmt.close();
            return;
        }
        rs.close();
        checkStmt.close();

        // Update GPA
        String updateSql = "UPDATE students SET gpa = ? WHERE student_id = ?";
        PreparedStatement pstmt = conn.prepareStatement(updateSql);
        pstmt.setDouble(1, newGpa);
        pstmt.setInt(2, studentId);

        int rowsAffected = pstmt.executeUpdate();
        if (rowsAffected > 0) {
            System.out.println("GPA updated successfully");
        }
        pstmt.close();
    } catch (SQLException e) {
        e.printStackTrace();
    }
}
```

```
    }

    public static void viewStudentRecord(Connection conn, Scanner scanner) {
        try {
            int studentId = scanner.nextInt();
            scanner.nextLine(); // consume newline

            String sql = "SELECT * FROM students WHERE student_id = ?";
            PreparedStatement pstmt = conn.prepareStatement(sql);
            pstmt.setInt(1, studentId);

            ResultSet rs = pstmt.executeQuery();

            if (rs.next()) {
                int id = rs.getInt("student_id");
                String name = rs.getString("name");
                String gradeLevel = rs.getString("grade_level");
                double gpa = rs.getDouble("gpa");

                System.out.printf("ID: %d | Name: %s | Grade Level: %s | GPA: %.2f%n",
                    id, name, gradeLevel, gpa);
            } else {
                System.out.println("Student not found.");
            }

            rs.close();
            pstmt.close();
        } catch (SQLException e) {
            e.printStackTrace();
        }
    }
}
```

```
public static void displayAllStudents(Connection conn) {
    try {
        String sql = "SELECT * FROM students ORDER BY student_id";
        Statement stmt = conn.createStatement();
        ResultSet rs = stmt.executeQuery(sql);

        System.out.println("ID | Name | Grade Level | GPA");
        while (rs.next()) {
            int id = rs.getInt("student_id");
            String name = rs.getString("name");

```

```
        String gradeLevel = rs.getString("grade_level");
        double gpa = rs.getDouble("gpa");

        System.out.printf("%d | %s | %s | %.2f%n", id, name, gradeLevel, gpa);
    }

    rs.close();
    stmt.close();
} catch (SQLException e) {
    e.printStackTrace();
}
}

}
```

**Status :** Correct

**Marks :** 10/10