Experiment 7

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Branch: CSE 3rd Year **Section/Group: 640-A**

Semester: 6th **Date of Performance: 17-03-25**

Subject Name: Project Based Learning with JAVA **Subject Code: 22CSH-359**

1. Aim:

Easy Level

Problem Statement:

Create a Java program to connect to a MySQL database and fetch data from a single table. The program should:

- Use DriverManager and Connection objects
- Retrieve and display all records from a table named Employee with columns EmpID, Name, and Salary

Medium Level

Problem Statement:

Build a program to perform CRUD operations (Create, Read, Update, Delete) on a database table Product with columns: ProductID, ProductName, Price, and Quantity. The program should include:

- Menu-driven options for each operation
- Transaction handling to ensure data integrity

Hard Level

Problem Statement:

Develop a Java application using JDBC and MVC architecture to manage student data. The application should:

- Use a Student class as the model with fields like StudentID, Name, Department, and Marks
- Include a database table to store student data
- Allow the user to perform CRUD operations through a simple menu-driven view
- Implement database operations in a separate controller class

Implementation/Code:

```
import java.sql.*;
```

```java
public class EmployeeDataFetcher {
    public static void main(String[] args) {
        String url = "jdbc:mysql://localhost:3306/company";
        String user = "root";
        String password = "password";

        try {
            Class.forName("com.mysql.cj.jdbc.Driver");
            Connection conn = DriverManager.getConnection(url, user, password);

            String sql = "SELECT EmpID, Name, Salary FROM Employee";
            Statement stmt = conn.createStatement();
            ResultSet rs = stmt.executeQuery(sql);

            System.out.println("Employee Records:");
            while (rs.next()) {
                int empId = rs.getInt("EmpID");
                String name = rs.getString("Name");
                double salary = rs.getDouble("Salary");
                System.out.println(empId + " | " + name + " | " + salary);
            }

            rs.close();
            stmt.close();
            conn.close();
        } catch (Exception e) {
            e.printStackTrace();
        }
    }
}
```

OUTPUT:

```
Output
Employee Records:
1 | Jobanjeet | 50000.0
2 | Vikram | 60000.0
3 | Amar | 45000.0
```

Medium Level

Implementation/Code:

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

public class ProductCRUD {
    static Connection conn;
    static {
        try {
            Class.forName("com.mysql.cj.jdbc.Driver");
            conn = DriverManager.getConnection(
                "jdbc:mysql://localhost:3306/inventory", "root", "password");
        } catch (Exception e) {
            e.printStackTrace();
        }
    }

    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        boolean running = true;

        while (running) {
            System.out.println("\nCRUD Operations Menu:");
            System.out.println("1. Create New Product");
            System.out.println("2. Read All Products");
            System.out.println("3. Update Product");
            System.out.println("4. Delete Product");
            System.out.println("5. Exit");
            System.out.print("Enter your choice: ");

            int choice = scanner.nextInt();
            scanner.nextLine(); // Consume newline

            try {
                switch (choice) {
                    case 1:
                        createProduct(scanner);
                        break;
                    case 2:
                        readProducts();
                        break;
                    case 3:
                        updateProduct(scanner);
                        break;
                    case 4:
                        deleteProduct(scanner);
                        break;
                    case 5:
                        running = false;
                        break;
                    default:
```

```
                        System.out.println("Invalid choice!");
                }
            } catch (SQLException e) {
                e.printStackTrace();
            }
        }

        scanner.close();
        try { conn.close(); } catch (SQLException e) {}
    }

    private static void createProduct(Scanner scanner) throws SQLException {
        System.out.print("Enter Product Name: ");
        String name = scanner.nextLine();
        System.out.print("Enter Price: ");
        double price = scanner.nextDouble();
        System.out.print("Enter Quantity: ");
        int quantity = scanner.nextInt();

        String sql = "INSERT INTO Product (ProductName, Price, Quantity) VALUES
(?, ?, ?)";
        try (PreparedStatement pstmt = conn.prepareStatement(sql)) {
            pstmt.setString(1, name);
            pstmt.setDouble(2, price);
            pstmt.setInt(3, quantity);
            int rows = pstmt.executeUpdate();
            System.out.println(rows + " product inserted successfully.");
        }
    }

    private static void readProducts() throws SQLException {
        String sql = "SELECT ProductID, ProductName, Price, Quantity FROM
Product";
        try (Statement stmt = conn.createStatement();
             ResultSet rs = stmt.executeQuery(sql)) {

            System.out.println("\nProduct List:");
            while (rs.next()) {
                int id = rs.getInt("ProductID");
                String name = rs.getString("ProductName");
                double price = rs.getDouble("Price");
                int quantity = rs.getInt("Quantity");
                System.out.printf("%d | %s | $%.2f | %d%n", id, name, price,
quantity);
            }
        }
    }

    private static void updateProduct(Scanner scanner) throws SQLException {
```

```
        readProducts();
        System.out.print("Enter ProductID to update: ");
        int id = scanner.nextInt();
        scanner.nextLine();

        System.out.print("Enter new Product Name: ");
        String name = scanner.nextLine();
        System.out.print("Enter new Price: ");
        double price = scanner.nextDouble();
        System.out.print("Enter new Quantity: ");
        int quantity = scanner.nextInt();

        String sql = "UPDATE Product SET ProductName = ?, Price = ?, Quantity =
? WHERE ProductID = ?";
        try (PreparedStatement pstmt = conn.prepareStatement(sql)) {
            pstmt.setString(1, name);
            pstmt.setDouble(2, price);
            pstmt.setInt(3, quantity);
            pstmt.setInt(4, id);
            int rows = pstmt.executeUpdate();
            System.out.println(rows + " product updated successfully.");
        }
    }

    private static void deleteProduct(Scanner scanner) throws SQLException {
        readProducts();
        System.out.print("Enter ProductID to delete: ");
        int id = scanner.nextInt();

        String sql = "DELETE FROM Product WHERE ProductID = ?";
        try (PreparedStatement pstmt = conn.prepareStatement(sql)) {
            pstmt.setInt(1, id);
            int rows = pstmt.executeUpdate();
            System.out.println(rows + " product deleted successfully.");
        }
    }
}
```

OUTPUT:

```
Output
CRUD Operations Menu:
1. Create New Product
2. Read All Products
3. Update Product
4. Delete Product
5. Exit
Enter your choice: 2

Product List:
1 | Laptop | $999.99 | 10
2 | Phone | $599.99 | 20
3 | Shirt | $29.99 | 50
```

Hard Level

Implementation/Code:

```
public class Student {
    private int studentID;
    private String name;
    private String department;
    private double marks;

    public Student() {}

    public Student(int studentID, String name, String department, double marks)
{
        this.studentID = studentID;
        this.name = name;
        this.department = department;
        this.marks = marks;
    }

    public int getStudentID() { return studentID; }
    public void setStudentID(int studentID) { this.studentID = studentID; }

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

    public String getDepartment() { return department; }
```

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

    public double getMarks() { return marks; }
    public void setMarks(double marks) { this.marks = marks; }

    @Override
    public String toString() {
        return String.format("ID: %d | Name: %s | Dept: %s | Marks: %.2f",
                studentID, name, department, marks);
    }
}
```

Controller - StudentController.java

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

public class StudentController {
    private Connection conn;

    public StudentController() {
        try {
            Class.forName("com.mysql.cj.jdbc.Driver");
            conn = DriverManager.getConnection(
                "jdbc:mysql://localhost:3306/university", "root", "password");
        } catch (Exception e) {
            e.printStackTrace();
        }
    }

    public void createStudent(Student student) {
        String sql = "INSERT INTO Student (Name, Department, Marks) VALUES (?,
?, ?)";
        try (PreparedStatement pstmt = conn.prepareStatement(sql,
Statement.RETURN_GENERATED_KEYS)) {
            pstmt.setString(1, student.getName());
            pstmt.setString(2, student.getDepartment());
            pstmt.setDouble(3, student.getMarks());

            int affectedRows = pstmt.executeUpdate();
            if (affectedRows > 0) {
                try (ResultSet rs = pstmt.getGeneratedKeys()) {
                    if (rs.next()) {
                        student.setStudentID(rs.getInt(1));
                    }
                }
            }
```

```
        } catch (SQLException e) {
            e.printStackTrace();
        }
    }

    public List<Student> getAllStudents() {
        List<Student> students = new ArrayList<>();
        String sql = "SELECT StudentID, Name, Department, Marks FROM Student";

        try (Statement stmt = conn.createStatement();
             ResultSet rs = stmt.executeQuery(sql)) {

            while (rs.next()) {
                Student student = new Student();
                student.setStudentID(rs.getInt("StudentID"));
                student.setName(rs.getString("Name"));
                student.setDepartment(rs.getString("Department"));
                student.setMarks(rs.getDouble("Marks"));
                students.add(student);
            }
        } catch (SQLException e) {
            e.printStackTrace();
        }

        return students;
    }

    public boolean updateStudent(Student student) {
        String sql = "UPDATE Student SET Name = ?, Department = ?, Marks = ?
WHERE StudentID = ?";
        try (PreparedStatement pstmt = conn.prepareStatement(sql)) {
            pstmt.setString(1, student.getName());
            pstmt.setString(2, student.getDepartment());
            pstmt.setDouble(3, student.getMarks());
            pstmt.setInt(4, student.getStudentID());

            return pstmt.executeUpdate() > 0;
        } catch (SQLException e) {
            e.printStackTrace();
            return false;
        }
    }

    public boolean deleteStudent(int studentID) {
        String sql = "DELETE FROM Student WHERE StudentID = ?";
        try (PreparedStatement pstmt = conn.prepareStatement(sql)) {
            pstmt.setInt(1, studentID);

            return pstmt.executeUpdate() > 0;
```

```
        } catch (SQLException e) {
            e.printStackTrace();
            return false;
        }
    }

    public void closeConnection() {
        try { if (conn != null) conn.close(); } catch (SQLException e) {}
    }
}
```

View - StudentView.java

javaCopy

```
import java.util.List;
import java.util.Scanner;

public class StudentView {
    private Scanner scanner = new Scanner(System.in);

    public int showMainMenu() {
        System.out.println("\nStudent Management System");
        System.out.println("1. Add New Student");
        System.out.println("2. View All Students");
        System.out.println("3. Update Student");
        System.out.println("4. Delete Student");
        System.out.println("5. Exit");
        System.out.print("Enter your choice: ");
        return scanner.nextInt();
    }

    public Student getNewStudentDetails() {
        scanner.nextLine(); // Consume newline
        System.out.print("Enter Student Name: ");
        String name = scanner.nextLine();
        System.out.print("Enter Department: ");
        String department = scanner.nextLine();
        System.out.print("Enter Marks: ");
        double marks = scanner.nextDouble();

        return new Student(0, name, department, marks);
    }

    public void displayStudents(List<Student> students) {
        System.out.println("\nList of Students:");
        for (Student student : students) {
            System.out.println(student);
        }
    }
```

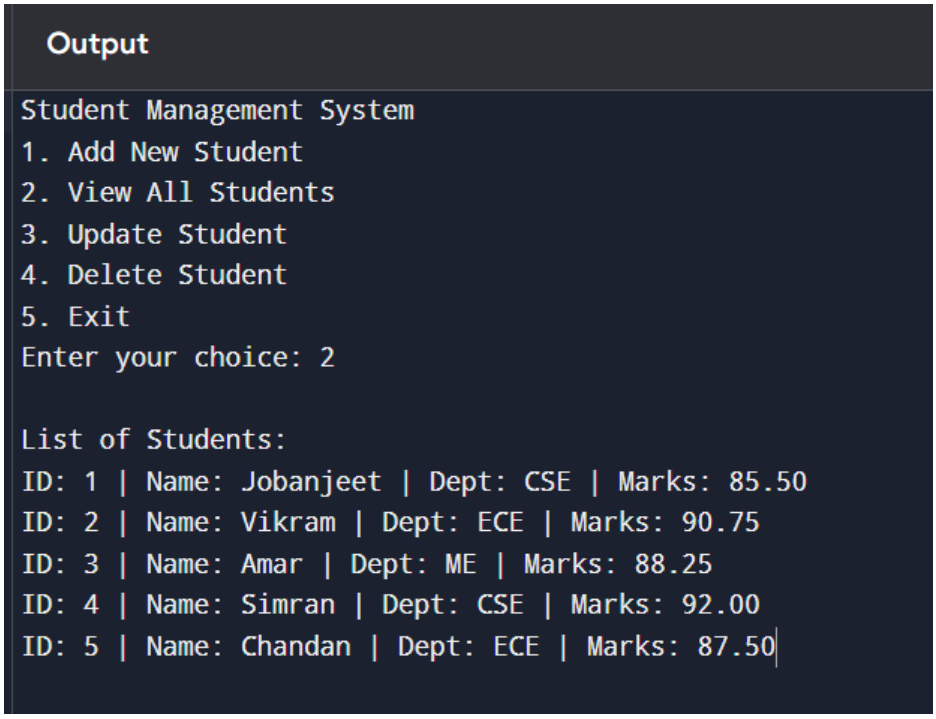
```
    public int getStudentIDToUpdate() {
        System.out.print("Enter Student ID to update: ");
        return scanner.nextInt();
    }

    public Student getUpdatedStudentDetails(Student existingStudent) {
        scanner.nextLine(); // Consume newline
        System.out.print("Enter New Name (" + existingStudent.getName() + "):
");
        String name = scanner.nextLine().trim();
        if (name.isEmpty()) name = existingStudent.getName();

        System.out.print("Enter New Department (" +
existingStudent.getDepartment() + "): ");
        String department = scanner.nextLine().trim();
        if (department.isEmpty()) department = existingStudent.getDepartment();

        System.out.print("Enter New Marks (" + existingStudent.getMarks() + "):
");
        double marks = scanner.nextDouble();
        if (marks == 0) marks = existingStudent.getMarks();

        return new Student(existingStudent.getStudentID(), name, department,
marks);
    }

    public int getStudentIDToDelete() {
        System.out.print("Enter Student ID to delete: ");
        return scanner.nextInt();
    }
}
```

Main Application - StudentManagementApp.java

```
public class StudentManagementApp {
    public static void main(String[] args) {
        StudentController controller = new StudentController();
        StudentView view = new StudentView();

        boolean running = true;
        while (running) {
            int choice = view.showMainMenu();

            switch (choice) {
                case 1:
                    Student newStudent = view.getNewStudentDetails();
                    controller.createStudent(newStudent);
                    System.out.println("Student added successfully!");
                    break;
                case 2:
```

```
                    List<Student> students = controller.getAllStudents();
                    view.displayStudents(students);
                    break;
                case 3:
                    int updateId = view.getStudentIDToUpdate();
                    List<Student> currentStudents = controller.getAllStudents();
                    Student existingStudent = null;
                    for (Student s : currentStudents) {
                        if (s.getStudentID() == updateId) {
                            existingStudent = s;
                            break;
                        }
                    }
                    if (existingStudent != null) {
                        Student updatedStudent =
view.getUpdatedStudentDetails(existingStudent);
                        if (controller.updateStudent(updatedStudent)) {
                            System.out.println("Student updated successfully!");
                        } else {
                            System.out.println("Failed to update student.");
                        }
                    } else {
                        System.out.println("Student not found!");
                    }
                    break;
                case 4:
                    int deleteId = view.getStudentIDToDelete();
                    if (controller.deleteStudent(deleteId)) {
                        System.out.println("Student deleted successfully!");
                    } else {
                        System.out.println("Failed to delete student or student
not found.");
                    }
                    break;
                case 5:
                    running = false;
                    break;
                default:
                    System.out.println("Invalid choice!");
            }
        }

        controller.closeConnection();
        System.out.println("Thank you for using Student Management System!");
    }
}
```

OUTPUT:



Learning Outcome:

- Implement MVC architecture in Java applications
- Separate concerns between model, view, and controller components
- Manage database connections efficiently in larger applications
- Create maintainable and scalable database applications
- Understand transaction management in complex operations