Experiment 7

Student Name: Divyanshu Jaiswal **UID: 22BCS12806**
Branch: B.E. CSE **Section/Group: KRG - 2 B**
Semester: 6th **Date of Performance: 11/02/25**
Subject Name: PBLJ LAB **Subject Code: 22CSH-359**

1. **Aim:** Create Java applications with JDBC for database connectivity, CRUD operations, and MVC architecture.

2. **Easy Level:** 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.

3. **Implementation/Code:**

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

public class EmployeeDatabase {
    private static final String DB_URL = "jdbc:mysql://localhost:3808/test";
    private static final String USERNAME = "root";
    private static final String PASSWORD = "******";

    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        while (true) {
            System.out.println("\n=== Employee Management System ===");
            System.out.println("1) View Employee List");
            System.out.println("2) Exit");
            System.out.print("Select an option: ");

            int option = scanner.nextInt();
            if (option == 1) {
                fetchEmployees();
            } else if (option == 2) {
                System.out.println("Goodbye!");
                break;
            } else {
                System.out.println("Invalid choice! Please try again.");
            }
        }
        scanner.close();
    }
    private static void fetchEmployees() {
        String query = "SELECT EmpID, Name, Salary FROM Employee";
```

```
            try (Connection conn = DriverManager.getConnection(DB_URL, USERNAME,
PASSWORD);
                 Statement stmt = conn.createStatement();
                 ResultSet rs = stmt.executeQuery(query)) {

               System.out.println("\nEmployee Details:");
               System.out.println("ID | Name | Salary");
               System.out.println("--------------------");

               while (rs.next()) {
                  System.out.printf("%d | %s | %.2f%n", rs.getInt("EmpID"),
rs.getString("Name"),
                        rs.getDouble("Salary"));
               }
            } catch (SQLException ex) {
               System.err.println("Database connection error: " + ex.getMessage());
            }
        }
    }
```

4. **Medium Level:** 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.
5. **Implementation code:**

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

public class ProductManager {
   private static final String DB_URL = "jdbc:mysql://localhost:3808/test";
   private static final String USER = "root";
   private static final String PASSWORD = "********";

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

      while (running) {
         System.out.println("\n===== Product Management =====");
         System.out.println("1) Add Product");
         System.out.println("2) View Products");
         System.out.println("3) Update Product");
         System.out.println("4) Delete Product");
         System.out.println("5) Exit");
```

```
            System.out.print("Choose an option: ");
            int choice = scanner.nextInt();
            scanner.nextLine(); // Clear newline buffer
            switch (choice) {
                case 1 -> addProduct(scanner);
                case 2 -> viewProducts();
                case 3 -> updateProduct(scanner);
                case 4 -> deleteProduct(scanner);
                case 5 -> {
                    System.out.println("Exiting application...");
                    running = false;
                }
                default -> System.out.println("Invalid option! Try again.");
            }
        }
        scanner.close();
    }

    private static void addProduct(Scanner scanner) {
        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 (Connection conn = DriverManager.getConnection(DB_URL, USER, PASSWORD);
            PreparedStatement stmt = conn.prepareStatement(sql)) {

            stmt.setString(1, name);
            stmt.setDouble(2, price);
            stmt.setInt(3, quantity);

            int rowsInserted = stmt.executeUpdate();
            if (rowsInserted > 0) {
                System.out.println("Product added successfully!");
            } else {
                System.out.println("Failed to add product.");
            }
        } catch (SQLException ex) {
            System.err.println("Error adding product: " + ex.getMessage());
        }
    }
```

```
private static void viewProducts() {
    String sql = "SELECT * FROM Product";

    try (Connection conn = DriverManager.getConnection(DB_URL, USER, PASSWORD);
            Statement stmt = conn.createStatement();
            ResultSet rs = stmt.executeQuery(sql)) {

        System.out.println("\nProduct List:");
        System.out.println("ID | Name | Price | Quantity");
        System.out.println("--------------------------------");

        while (rs.next()) {
            System.out.printf("%d | %s | %.2f | %d%n",
                    rs.getInt("ProductID"),
                    rs.getString("ProductName"),
                    rs.getDouble("Price"),
                    rs.getInt("Quantity"));
        }
    } catch (SQLException ex) {
        System.err.println("Error retrieving products: " + ex.getMessage());
    }
}

private static void updateProduct(Scanner scanner) {
    System.out.print("Enter product ID to update: ");
    int id = scanner.nextInt();
    scanner.nextLine(); // Clear buffer
    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 (Connection conn = DriverManager.getConnection(DB_URL, USER, PASSWORD);
            PreparedStatement stmt = conn.prepareStatement(sql)) {
        stmt.setString(1, name);
        stmt.setDouble(2, price);
        stmt.setInt(3, quantity);
        stmt.setInt(4, id);

        int rowsUpdated = stmt.executeUpdate();
        if (rowsUpdated > 0) {
            System.out.println("Product updated successfully!");
        } else {
            System.out.println("Product ID not found.");
        }
    } catch (SQLException ex) {
        System.err.println("Error updating product: " + ex.getMessage());
    }
}

private static void deleteProduct(Scanner scanner) {
    System.out.print("Enter product ID to delete: ");
    int id = scanner.nextInt();

    String sql = "DELETE FROM Product WHERE ProductID=?";
    try (Connection conn = DriverManager.getConnection(DB_URL, USER, PASSWORD);
            PreparedStatement stmt = conn.prepareStatement(sql)) {
        stmt.setInt(1, id);
        int rowsDeleted = stmt.executeUpdate();

        if (rowsDeleted > 0) {
            System.out.println("Product deleted successfully!");
        } else {
            System.out.println("Product ID not found.");
        }
    } catch (SQLException ex) {
        System.err.println("Error deleting product: " + ex.getMessage());
    }
}
 }
```

6. Hard Level: 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.

7. Implementation/Code:

Model

```
public class Student {
    private int id;
    private String fullName;
    private String dept;
    private int score;

    public Student(int id, String fullName, String dept, int score) {
        this.id = id;
        this.fullName = fullName;
        this.dept = dept;
        this.score = score;
    }
    // Getters and Setters
    public int getId() { return id; }
    public void setId(int id) { this.id = id; }

    public String getFullName() { return fullName; }
    public void setFullName(String fullName) { this.fullName = fullName; }
    public String getDept() { return dept; }
    public void setDept(String dept) { this.dept = dept; }

    public int getScore() { return score; }
    public void setScore(int score) { this.score = score; }

    @Override
    public String toString() {
        return "Student ID: " + id + ", Name: " + fullName + ", Department: " + dept + ",
Score: " + score;
    }
}
```

View

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

public class StudentView {
    private final StudentController studentController = new StudentController();
    private final Scanner inputScanner = new Scanner(System.in);
    public void showMenu() {
        int option;
        do {
                System.out.println("\n=== Student Management Portal ===");
            System.out.println("1. Register Student");
            System.out.println("2. Display All Students");
            System.out.println("3. Modify Student Details");
            System.out.println("4. Remove Student");
            System.out.println("5. Exit");
            System.out.print("Select an option: ");
            option = inputScanner.nextInt();

            inputScanner.nextLine(); // Consume newline
            switch (option) {
                case 1:
                    registerStudent();
                    break;
                case 2:
                    listStudents();
                    break;
                case 3:
                    modifyStudent();
                    break;
                case 4:
                    removeStudent();
                    break;
                case 5:
                    System.out.println("Closing application...");
                    break;
                default:
                    System.out.println("Invalid option, please try again.");
            }
        } while (option != 5);
              }

    private void registerStudent() {
        System.out.print("Enter Student Name: ");
        String fullName = inputScanner.nextLine();
        System.out.print("Enter Department: ");
        String department = inputScanner.nextLine();
        System.out.print("Enter Marks: ");
        int score = inputScanner.nextInt();

        Student newStudent = new Student(0, fullName, department, score);
        studentController.addStudent(newStudent);
    }

    private void listStudents() {
        List<Student> studentList = studentController.getAllStudents();
        if (studentList.isEmpty()) {
            System.out.println("No student records available.");
        } else {
            System.out.println("\n--- Student Records ---");
            for (Student student : studentList) {
                System.out.println(student);
                }
            }
        }

        private void modifyStudent() {
            System.out.print("Enter Student ID to update: ");
            int studentId = inputScanner.nextInt();
            inputScanner.nextLine(); // Consume newline
            System.out.print("Enter Updated Name: ");
            String updatedName = inputScanner.nextLine();
            System.out.print("Enter Updated Department: ");
            String updatedDepartment = inputScanner.nextLine();
            System.out.print("Enter Updated Marks: ");
            int updatedScore = inputScanner.nextInt();

            Student updatedStudent = new Student(studentId, updatedName,
updatedDepartment, updatedScore);
            studentController.updateStudent(updatedStudent);
        }

        private void removeStudent() {
            System.out.print("Enter Student ID to remove: ");
            int studentId = inputScanner.nextInt();
            studentController.deleteStudent(studentId);
        }
    }
```

Controller

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

    public class StudentController {
        private static final String DB_URL = "jdbc:mysql://localhost:3306/javadb";
        private static final String DB_USER = "root";
        private static final String DB_PASSWORD = "karan.111";

        public void insertStudent(Student student) {
        String sql = "INSERT INTO Students (Name, Department, Marks) VALUES (?, ?, ?)";
            try (Connection connection = DriverManager.getConnection(DB_URL,
DB_USER, DB_PASSWORD);
                PreparedStatement preparedStatement = connection.prepareStatement(sql)) {
```

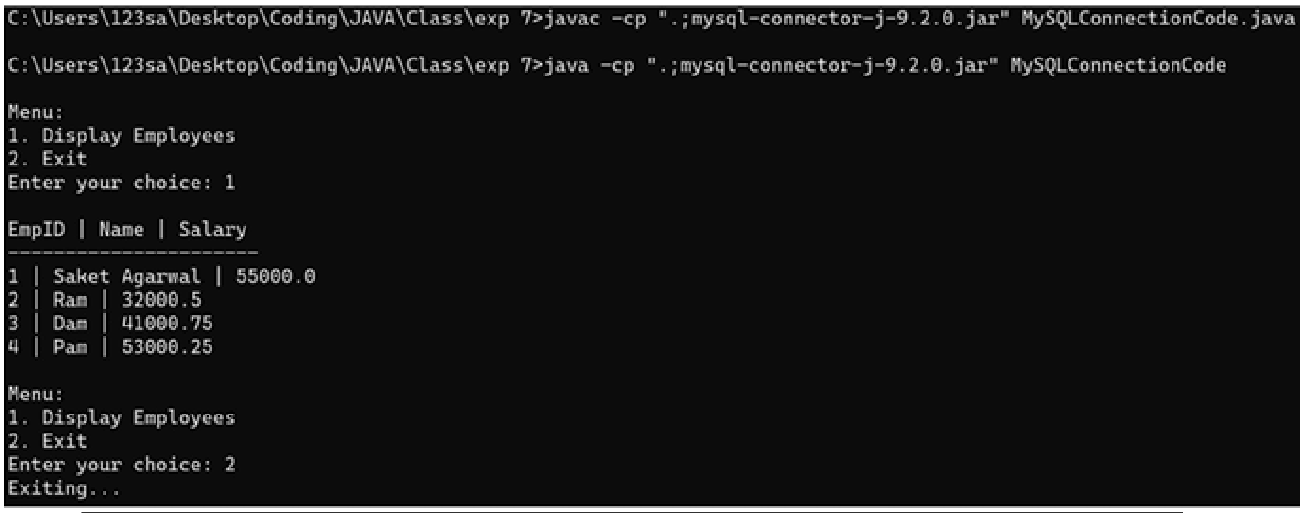
```
                connection.setAutoCommit(false);
                preparedStatement.setString(1, student.getName());
                preparedStatement.setString(2, student.getDepartment());
                preparedStatement.setInt(3, student.getMarks());

                preparedStatement.executeUpdate();
                connection.commit();
                System.out.println("Student successfully registered!");

            } catch (SQLException ex) {
                ex.printStackTrace();
            }
        }

        public List<Student> fetchAllStudents() {
            List<Student> studentList = new ArrayList<>();
            String sql = "SELECT * FROM Students";

            try (Connection connection = DriverManager.getConnection(DB_URL,
DB_USER, DB_PASSWORD);
                 Statement statement = connection.createStatement();
                 ResultSet resultSet = statement.executeQuery(sql)) {
                while (resultSet.next()) {
                    studentList.add(new Student(resultSet.getInt("StudentID"),
                            resultSet.getString("Name"),
                            resultSet.getString("Department"),
                            resultSet.getInt("Marks")));
                }
                    } catch (SQLException ex) {
                ex.printStackTrace();
            }
            return studentList;
        }

        public void modifyStudent(Student student) {
            String sql = "UPDATE Students SET Name=?, Department=?, Marks=? WHERE
StudentID=?";
            try (Connection connection = DriverManager.getConnection(DB_URL,
DB_USER, DB_PASSWORD);
                 PreparedStatement preparedStatement = connection.prepareStatement(sql)) {
```

```
                connection.setAutoCommit(false);
                preparedStatement.setString(1, student.getName());
                preparedStatement.setString(2, student.getDepartment());
                preparedStatement.setInt(3, student.getMarks());
                preparedStatement.setInt(4, student.getStudentID());

                int affectedRows = preparedStatement.executeUpdate();
                if (affectedRows > 0) {
                    connection.commit();
                    System.out.println("Student details updated!");
                } else {
                    System.out.println("No record found with the given Student ID.");
                }

            } catch (SQLException ex) {
                ex.printStackTrace();
            }
        }
        public void removeStudent(int studentID) {
            String sql = "DELETE FROM Students WHERE StudentID=?";

            try (Connection connection = DriverManager.getConnection(DB_URL,
DB_USER, DB_PASSWORD);
                 PreparedStatement preparedStatement = connection.prepareStatement(sql)) {

                connection.setAutoCommit(false);
                preparedStatement.setInt(1, studentID);
                int affectedRows = preparedStatement.executeUpdate();
                if (affectedRows > 0) {
                    connection.commit();
                    System.out.println("Student record deleted!");
                } else {
                    System.out.println("No record found with the given Student ID.");
                }

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

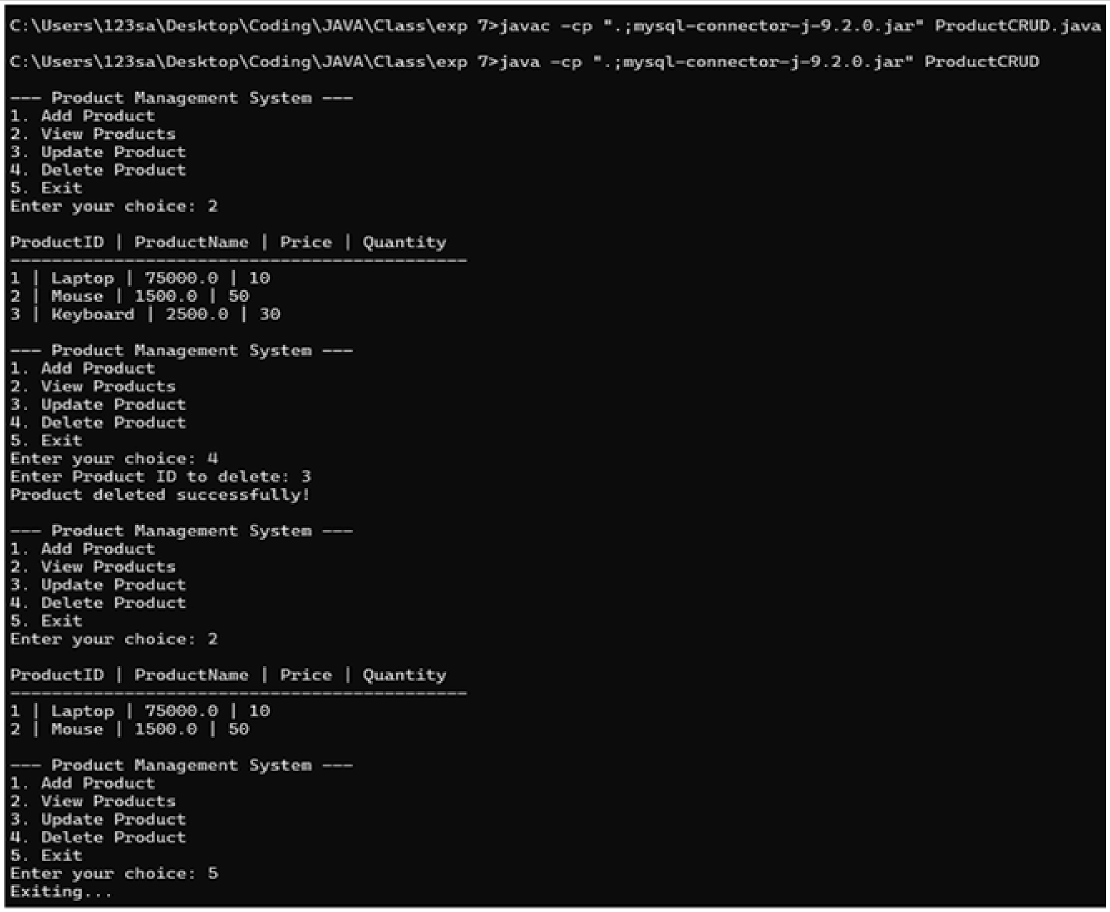
Main

```
public class StudentApplication {
    public static void main(String[] args) {
        StudentView studentView = new StudentView();
        studentView.showMenu();
    }
}
```

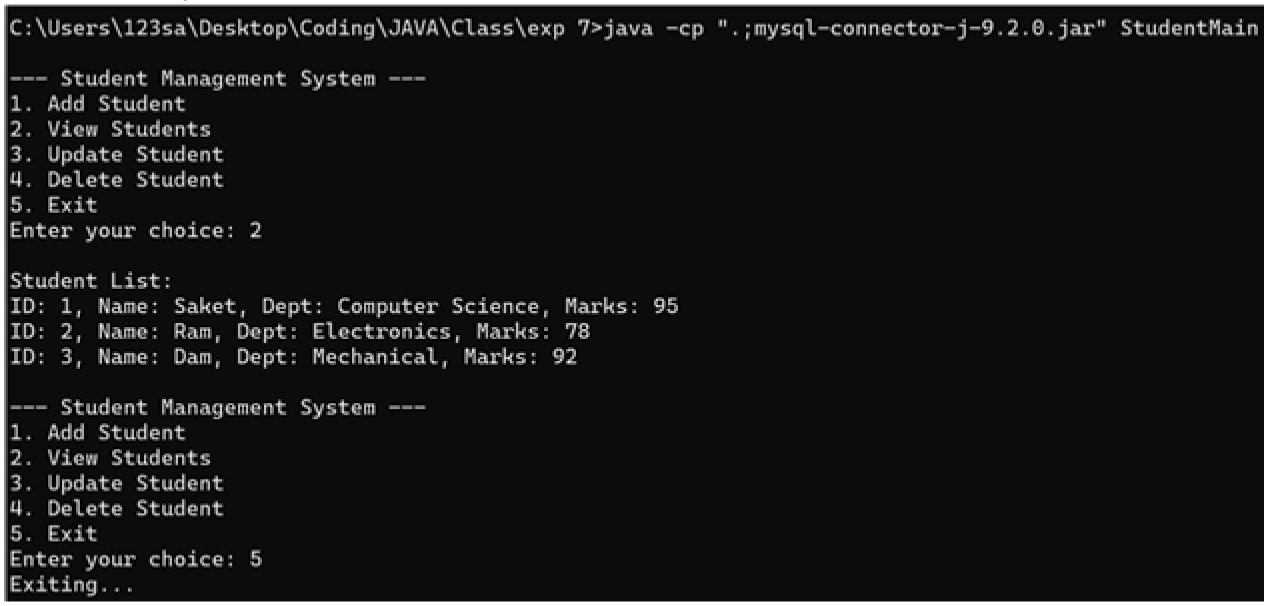
8. Output:



```
C:\Users\123sa\Desktop\Coding\JAVA\Class\exp 7>javac -cp ".;mysql-connector-j-9.2.0.jar" MySQLConnectionCode.java

C:\Users\123sa\Desktop\Coding\JAVA\Class\exp 7>java -cp ".;mysql-connector-j-9.2.0.jar" MySQLConnectionCode

Menu:
1. Display Employees
2. Exit
Enter your choice: 1

EmpID | Name | Salary
----------------------
1 | Saket Agarwal | 55000.0
2 | Ram | 32000.5
3 | Dam | 41000.75
4 | Pam | 53000.25

Menu:
1. Display Employees
2. Exit
Enter your choice: 2
Exiting...
```



```
C:\Users\123sa\Desktop\Coding\JAVA\Class\exp 7>javac -cp ".;mysql-connector-j-9.2.0.jar" ProductCRUD.java

C:\Users\123sa\Desktop\Coding\JAVA\Class\exp 7>java -cp ".;mysql-connector-j-9.2.0.jar" ProductCRUD

--- Product Management System ---
1. Add Product
2. View Products
3. Update Product
4. Delete Product
5. Exit
Enter your choice: 2

ProductID | ProductName | Price | Quantity
--------------------------------------------
1 | Laptop | 75000.0 | 10
2 | Mouse | 1500.0 | 50
3 | Keyboard | 2500.0 | 30

--- Product Management System ---
1. Add Product
2. View Products
3. Update Product
4. Delete Product
5. Exit
Enter your choice: 4
Enter Product ID to delete: 3
Product deleted successfully!

--- Product Management System ---
1. Add Product
2. View Products
3. Update Product
4. Delete Product
5. Exit
Enter your choice: 2

ProductID | ProductName | Price | Quantity
--------------------------------------------
1 | Laptop | 75000.0 | 10
2 | Mouse | 1500.0 | 50

--- Product Management System ---
1. Add Product
2. View Products
3. Update Product
4. Delete Product
5. Exit
Enter your choice: 5
Exiting...
```



```
C:\Users\123sa\Desktop\Coding\JAVA\Class\exp 7>java -cp ".;mysql-connector-j-9.2.0.jar" StudentMain

--- Student Management System ---
1. Add Student
2. View Students
3. Update Student
4. Delete Student
5. Exit
Enter your choice: 2

Student List:
ID: 1, Name: Saket, Dept: Computer Science, Marks: 95
ID: 2, Name: Ram, Dept: Electronics, Marks: 78
ID: 3, Name: Dam, Dept: Mechanical, Marks: 92

--- Student Management System ---
1. Add Student
2. View Students
3. Update Student
4. Delete Student
5. Exit
Enter your choice: 5
Exiting...
```