Experiment -5

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Subject Name: Project Based Learning in Java with Lab **Subject Code: 22CSH-359**

5.1.1 Aim: Write a Java program to calculate the sum of a list of integers using autoboxing and unboxing. Include methods to parse strings into their respective wrapper classes (e.g.,Integer.parseInt()).

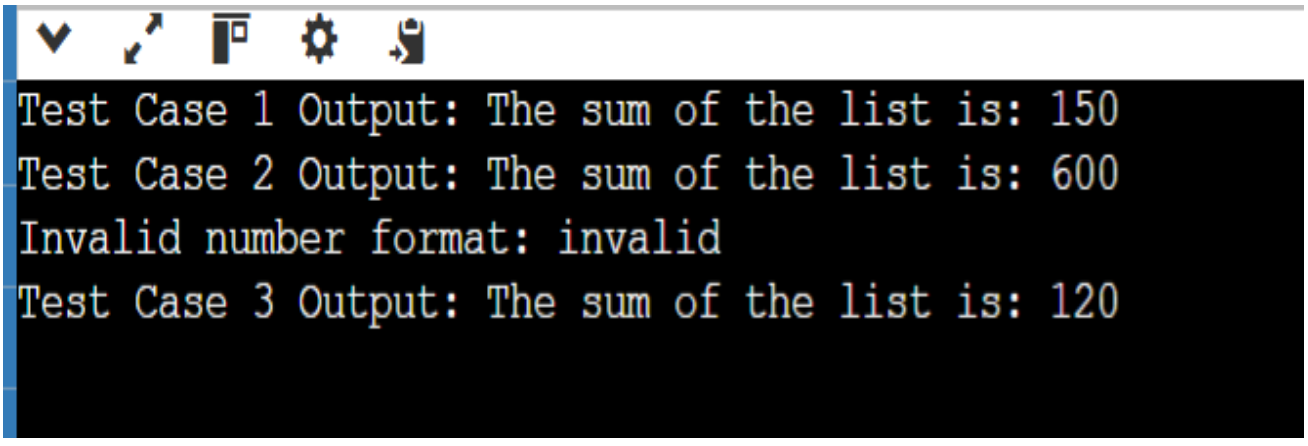
5.1.2Objective: The program demonstrates autoboxing and unboxing in Java by parsing a list of integer strings into their respective wrapper classes (Integer), computing their sum, and printing the result.

5..1.3 Code:

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

public class SumCalculator {
    public static Integer parseStringToInteger(String str) {
        try {
            return Integer.parseInt(str);
        } catch (NumberFormatException e) {
            System.out.println("Invalid number format: " + str);
            return null;
        }
    }

    public static int calculateSum(List<Integer> numbers) {
        int sum = 0;
        for (Integer num : numbers) {
            if (num != null) {
                sum += num;
            }
        }
        return sum;
    }


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

```
        List<Integer> list1 = new ArrayList<>();
        list1.add(10);
        list1.add(20);
        list1.add(30);
        list1.add(parseStringToInteger("40"));
        list1.add(parseStringToInteger("50"));

        System.out.println("Test Case 1 Output: The sum of the list is: " +
    calculateSum(list1));

        List<Integer> list2 = new ArrayList<>();
        list2.add(parseStringToInteger("100"));
        list2.add(parseStringToInteger("200"));
        list2.add(parseStringToInteger("300"));

        System.out.println("Test Case 2 Output: The sum of the list is: " +
    calculateSum(list2));

        List<Integer> list3 = new ArrayList<>();
        list3.add(parseStringToInteger("50"));
        list3.add(parseStringToInteger("invalid")); // Invalid input
        list3.add(parseStringToInteger("70"));

        System.out.println("Test Case 3 Output: The sum of the list is: " +
    calculateSum(list3));
    }
}
```

5.1.4 Output:



5.2.1 Aim: Create a Java program to serialize and deserialize a Student object. The program should: Serialize a Student object (containing id, name, and GPA) and save it to a file. Deserialize the object from the file and display the student details.HandleFileNotFoundException,IOException,andClassNotFound Exception using exception handling.

5.2.2 Objective: The program demonstrates serialization and deserialization in Java by storing a Student object (with id, name, and GPA) to a file and then retrieving it while handling possible exceptions.

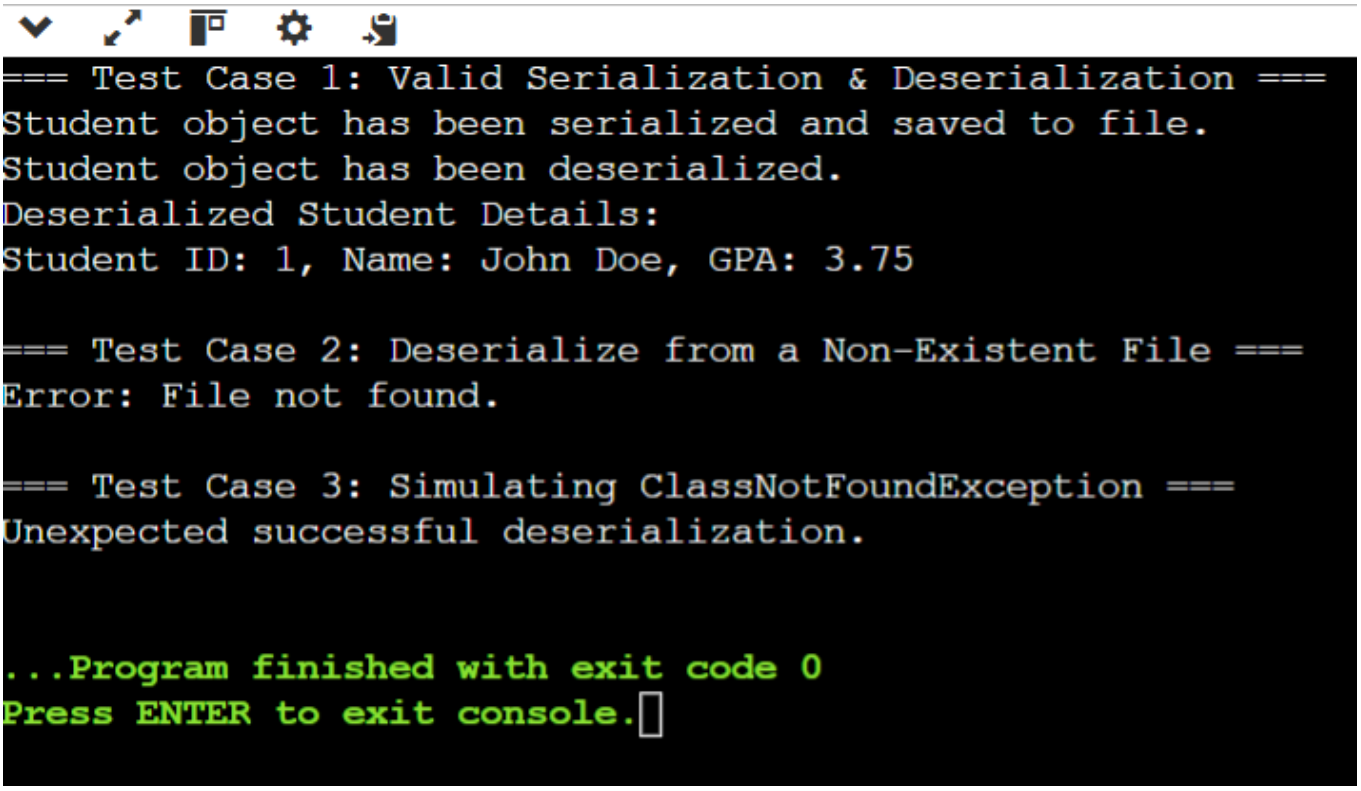
5.2.3 Code:

```
import java.io.*;

class Student implements Serializable {
    private static final long serialVersionUID = 1L;
    private int id;
    private String name;
    private double gpa;
    public Student(int id, String name, double gpa) {
        this.id = id;
        this.name = name;
        this.gpa = gpa;
    }
    public void display() {
        System.out.println("Student ID: " + id + ", Name: " + name + ", GPA: " + gpa);
    }
}
public class StudentSerializationDemo {
    private static final String FILE_NAME = "student.ser";

    public static void main(String[] args) {
        // **Test Case 1: Serialize and Deserialize a valid student object**
        System.out.println("=== Test Case 1: Valid Serialization & Deserialization ===");
        Student student = new Student(1, "John Doe", 3.75);
        serializeStudent(student);
        Student deserializedStudent = deserializeStudent(FILE_NAME);
        if (deserializedStudent != null) {
            System.out.println("Deserialized Student Details:");
            deserializedStudent.display();
        }
```

```
        // **Test Case 2: Try to deserialize from a non-existent file**
        System.out.println("\n=== Test Case 2: Deserialize from a Non-Existent File ===");
        deserializeStudent("non_existent_file.ser");

        // **Test Case 3: Handle invalid class during deserialization**

        System.out.println("\n=== Test Case 3: Simulating ClassNotFoundException ===");
        deserializeInvalidClass();
    }

    public static void serializeStudent(Student student) {
        try(ObjectOutputStreamoos=newObjectOutputStream(new
FileOutputStream(FILE_NAME))) {
            oos.writeObject(student);
            System.out.println("Student object has been serialized and saved to file.");
        } catch (FileNotFoundException e) {
            System.err.println("Error: File not found.");
        } catch (IOException e) {
            System.err.println("Error: IO Exception occurred during serialization.");
        }
    }

    public static Student deserializeStudent(String fileName) {
        try (ObjectInputStream ois = new ObjectInputStream(new FileInputStream(fileName))) {
            System.out.println("Student object has been deserialized.");
            return (Student) ois.readObject();
        } catch (FileNotFoundException e) {
            System.err.println("Error: File not found.");
        } catch (IOException e) {
            System.err.println("Error: IO Exception occurred during deserialization.");
        } catch (ClassNotFoundException e) {
            System.err.println("Error: Class not found.");
        }
        return null;
    }

    public static void deserializeInvalidClass() {
        try (ObjectInputStreamois= new ObjectInputStream(new FileInputStream
(FILE_NAME))) {
            Object obj = ois.readObject();
            if (!(obj instanceof Student)) {
```

```
                throw new ClassNotFoundException();
            }
            System.out.println("Unexpected successful deserialization.");
        } catch (FileNotFoundException e) {
            System.err.println("Error: File not found.");
        } catch (IOException e) {
            System.err.println("Error: IO Exception occurred during deserialization.");
        } catch (ClassNotFoundException e) {
            System.err.println("Error: Class not found.");
        }
    }
}
```

5.2.4Output:



5.3.1Aim: Create a menu-based Java application with the following options. 1.Add an Employee 2. Display All 3. Exit If option 1 is selected, the application should gather details of the employee like employee name, employee id, designation and salary and store it in a file. If option 2 is selected, the application should display all the employee details. If option 3 is selected the application should exit.

5.3.2Objective: The objective of this program is to develop a menu-driven Java application that allows users to add employee details, display all stored employees, and exit the program. Employee details, including ID, name, designation, and salary, are stored persistently in a file using serialization.

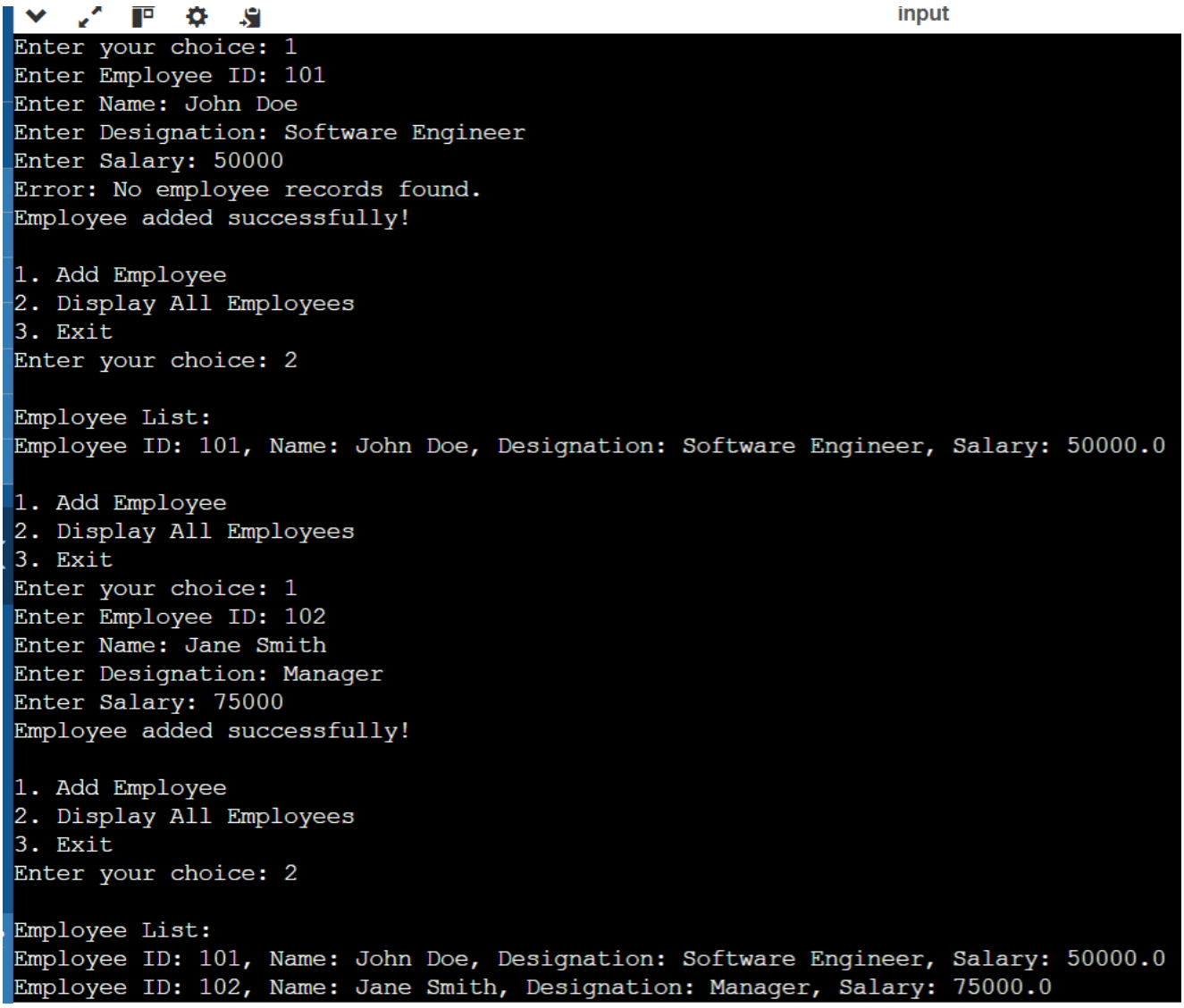
5.3.3 Code:

```
import java.io.*;
import java.util.*;
class Employee implements Serializable {
    private static final long serialVersionUID = 1L;
    private int id;
    private String name, designation;
    private double salary;

    public Employee(int id, String name, String designation, double salary) {
        this.id = id;
        this.name = name;
        this.designation = designation;
        this.salary = salary;
    }

    public void display() {
        System.out.println("Employee ID: " + id + ", Name: " + name + ", Designation: " +
designation + ", Salary: " + salary);
    }
}

public class EmployeeManagement {
    private static final String FILE_NAME = "employees.dat";
    private static Scanner scanner = new Scanner(System.in);

    public static void main(String[] args) {
        while (true) {
            System.out.println("\n1. Add Employee\n2. Display All Employees\n3. Exit");
            System.out.print("Enter your choice: ");
            int choice = scanner.nextInt();
            scanner.nextLine();
```

```
            switch (choice) {
                case 1:
                    addEmployee();
                    break;
                case 2:
                    displayAllEmployees();
                    break;
                case 3:
                    System.out.println("Exiting...");
                    System.exit(0);
                    break;
                default:
                    System.out.println("Invalid choice! Try again.");
            }
        }
    }
    private static void addEmployee() {
        System.out.print("Enter Employee ID: ");
        int id = scanner.nextInt();
        scanner.nextLine(); // Consume newline

        System.out.print("Enter Name: ");
        String name = scanner.nextLine();

        System.out.print("Enter Designation: ");
        String designation = scanner.nextLine();

        System.out.print("Enter Salary: ");
        double salary = scanner.nextDouble();

        Employee emp = new Employee(id, name, designation, salary);
        saveEmployeeToFile(emp);
        System.out.println("Employee added successfully!");
    }
    private static void saveEmployeeToFile(Employee employee) {
        List<Employee> employees = readEmployeesFromFile();
        employees.add(employee);

        try(ObjectOutputStreamoos=newObjectOutputStream(new
FileOutputStream(FILE_NAME))) {
            for (Employee emp : employees) {
                oos.writeObject(emp);
```

```
            }
        } catch (IOException e) {
            System.err.println("Error: Unable to save employee details.");
        }
    }
    private static void displayAllEmployees() {
        List<Employee> employees = readEmployeesFromFile();
        if (employees.isEmpty()) {
            System.out.println("No employees found.");
        } else {
            System.out.println("\nEmployee List:");
            for (Employee emp : employees) {
                emp.display();
            }
        }
    }
    private static List<Employee> readEmployeesFromFile() {
        List<Employee> employees = new ArrayList<>();
        try(ObjectInputStreamois = new ObjectInputStream(new
FileInputStream(FILE_NAME))) {
            while (true) {
                Employee emp = (Employee) ois.readObject();
                employees.add(emp);
            }
        } catch (EOFException e) {
        } catch (FileNotFoundException e) {
            System.err.println("Error: No employee records found.");
        } catch (IOException | ClassNotFoundException e) {
            System.err.println("Error: Unable to read employee details.");
        }
        return employees;
    }
}
```

5.3.4 Output:



Learning Outcomes:

1. Autoboxing & Unboxing: Convert between primitive types and wrapper classes while summing integers.
2. Serialization & Deserialization: Store and retrieve objects with exception handling.
3. File Handling & Menu-Driven Applications: Manage structured data and user interactions efficiently.