Experiment-5

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Semester: 6th **Date of Performance:** 24/02/2025
Subject Name: PBLJ with Lab **Subject Code:** 22CSH-359

1. **Aim:** Develop Java programs using autoboxing, serialization, file handling, and efficient data processing and management.

2. **Problem Statements:**
   Problem 1.1: 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()).
   Problem 1.2: 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.
   Handle FileNotFoundException, IOException, and ClassNotFoundException using exception handling.
   Problem 1.3: 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.

3. **Implementation/Code:**

Problem 1.1

```
import java.util.ArrayList;

import java.util.List;
```

```
public class AutoboxingUnboxingSum
  { public static void main(String[] args) {
    List<Integer> numbers = new ArrayList<>();

    numbers.add(10);
    numbers.add(20);
    numbers.add(30);

    numbers.add(Integer.parseInt("40"));
    numbers.add(Integer.valueOf("50"));

    int sum = calculateSum(numbers);

    System.out.println("List of numbers: " + numbers);
    System.out.println("Sum of numbers: " + sum);
  }

  public static int calculateSum(List<Integer> list)
    { int sum = 0;
    for (Integer num : list)
      { sum += num;
    }
    return sum;
    }
}
```

Problem 1.2:

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

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); System.out.println("Name: " +
        name);
        System.out.println("GPA: " + gpa);
        System.out.println("-------------------------- ");
    }
}

public class StudentSerialization {
    private static final String FILE_NAME = "studentData.txt";

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

        serializeStudents();

        System.out.print("Enter the file name to load student data: ");
        String userInput = scanner.nextLine();

        try {
            List<Student> students = deserializeStudents(userInput);
            if (students != null) {
                System.out.println("\nDeserialized Student Data:");
                for (Student student : students) {
                    student.display();
                }
            }
        } catch (FileNotFoundException e) {
            System.out.println("Error: File not found! Please check the filename and try
again.");
        } catch (IOException e) {
            System.out.println("Error: Issue reading the file.");
        } catch (ClassNotFoundException e)
            { System.out.println("Error: Student class not found.");
        } finally
            { scanner.close();
        }
    }

    private static void serializeStudents()
        { List<Student> students = new ArrayList<>();
        students.add(new Student(101, "Gautam Thakur", 9.8));
        students.add(new Student(102, "Harsh Kumar", 9.5));
        students.add(new Student(103, "Rohit Kumar", 9.2));

        try (ObjectOutputStream out = new ObjectOutputStream(new
FileOutputStream(FILE_NAME))) {
            out.writeObject(students);
            System.out.println("Student objects successfully serialized into " +
FILE_NAME);
        } catch (IOException e) {
            System.out.println("Error: Unable to serialize student data.");
        }
    }

    private static List<Student> deserializeStudents(String fileName) throws
IOException, ClassNotFoundException {
        File file = new File(fileName);

        if (!file.exists()) {
            throw new FileNotFoundException();
        }

        try (ObjectInputStream in = new ObjectInputStream(new
FileInputStream(file))) {
            return (List<Student>) in.readObject();
        }
    }
}
```

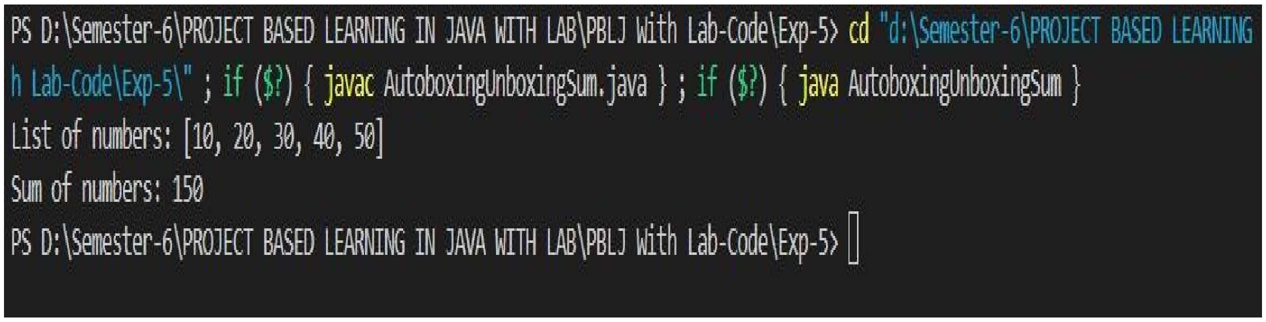
Problem 1.3:

```
import java.io.*;
import java.util.*;

class Employee implements Serializable
    { private String name;
    private int id;
    private String designation;
    private double salary;

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

    @Override
    public String toString() {
        return "Employee ID: " + id + ", Name: " + name + ", Designation: " +
designation + ", Salary: $" + salary;
    }
}

public class EmployeeManagementSystem {
    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("\nEmployee Management System");
        System.out.println("1. Add an Employee");
        System.out.println("2. Display All Employees");
        System.out.println("3. Exit");
        System.out.print("Enter your choice: ");

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

        switch (choice)
          { case 1:
              addEmployee();
              break;
          case 2:
              displayAllEmployees();
              break;
          case 3:
              System.out.println("Exiting the application. Goodbye!");
              System.exit(0);
          default:
              System.out.println("Invalid choice. Please try again.");
        }
    }
}
```

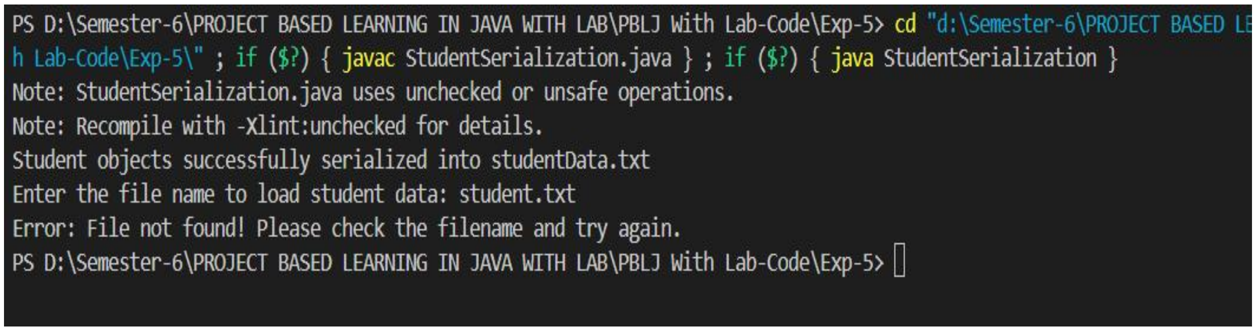
```
    private static void addEmployee()
      { System.out.print("Enter employee name: ");
      String name = scanner.nextLine();

      System.out.print("Enter employee ID: ");
      int id = scanner.nextInt();
      scanner.nextLine(); // Consume newline

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

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

      Employee employee = new Employee(name, id, designation, salary);

      try (ObjectOutputStream oos = new ObjectOutputStream(new
  FileOutputStream(FILE_NAME, true))) {
        oos.writeObject(employee);
        System.out.println("Employee added successfully!");
      } catch (IOException e) {
        System.out.println("Error writing to file: " + e.getMessage());
      }
    }


    private static void displayAllEmployees() {
        try (ObjectInputStream ois = new ObjectInputStream(new
FileInputStream(FILE_NAME))) {
            while (true)
                { try {
                    Employee employee = (Employee) ois.readObject();
                    System.out.println(employee);
                } catch (EOFException e)
                    { break; // End of file
                    reached
                }
            }
        } catch (FileNotFoundException e) {
            System.out.println("No employees found. The file is empty or doesn't
exist.");
        } catch (IOException | ClassNotFoundException e)
            { System.out.println("Error reading from file: " + e.getMessage());
        }
    }
}
```

4. Output:



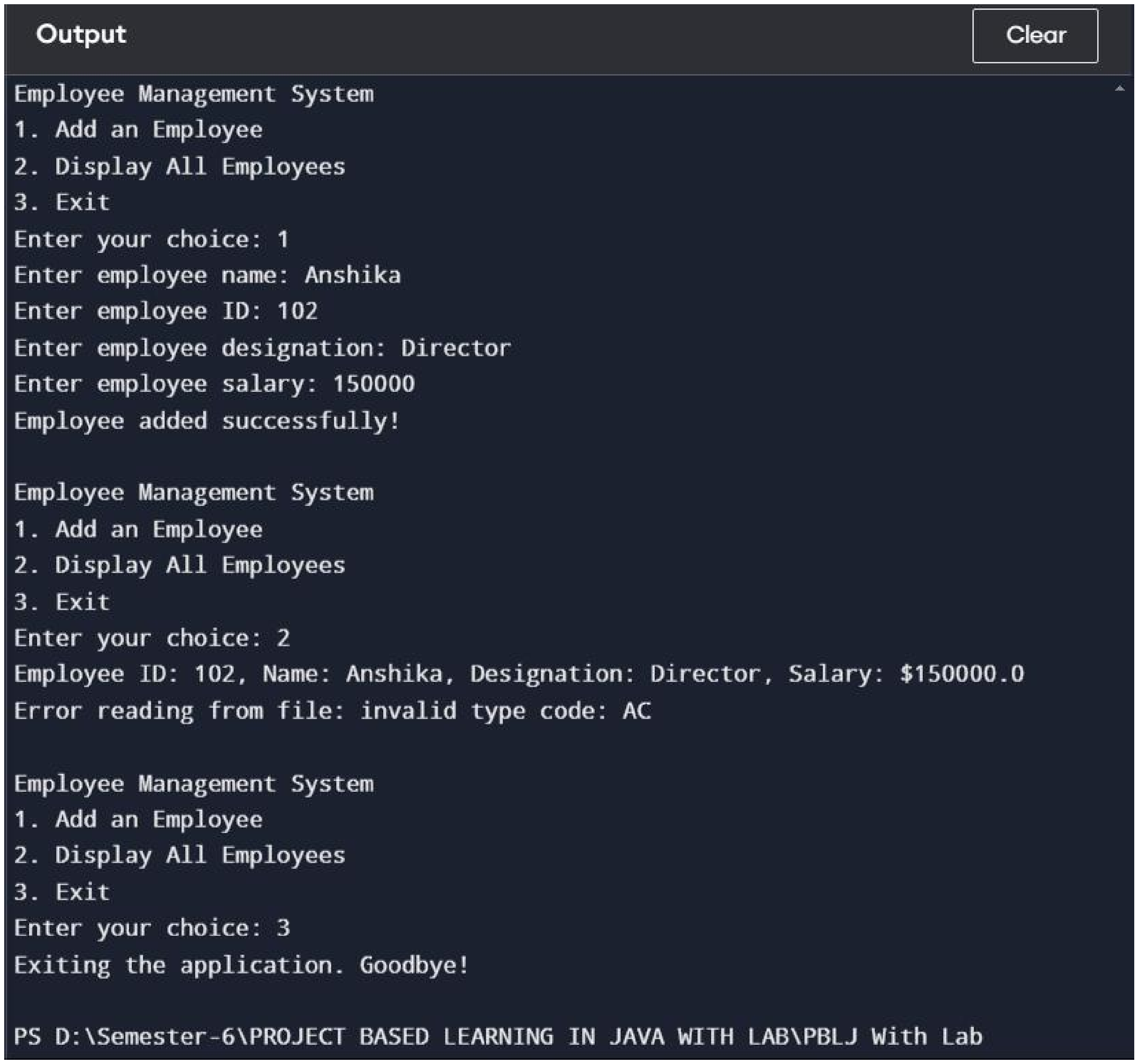
```
PS D:\Semester-6\PROJECT BASED LEARNING IN JAVA WITH LAB\PBLJ With Lab-Code\Exp-5> cd "d:\Semester-6\PROJECT BASED LEARNING
h Lab-Code\Exp-5\" ; if ($?) { javac AutoboxingUnboxingSum.java } ; if ($?) { java AutoboxingUnboxingSum }
List of numbers: [10, 20, 30, 40, 50]
Sum of numbers: 150
PS D:\Semester-6\PROJECT BASED LEARNING IN JAVA WITH LAB\PBLJ With Lab-Code\Exp-5>
```

(Fig. 1- Problem 1.1 Output)



```
PS D:\Semester-6\PROJECT BASED LEARNING IN JAVA WITH LAB\PBLJ With Lab-Code\Exp-5> cd "d:\Semester-6\PROJECT BASED LE
h Lab-Code\Exp-5\" ; if ($?) { javac StudentSerialization.java } ; if ($?) { java StudentSerialization }
Note: StudentSerialization.java uses unchecked or unsafe operations.
Note: Recompile with -Xlint:unchecked for details.
Student objects successfully serialized into studentData.txt
Enter the file name to load student data: student.txt
Error: File not found! Please check the filename and try again.
PS D:\Semester-6\PROJECT BASED LEARNING IN JAVA WITH LAB\PBLJ With Lab-Code\Exp-5>
```

(Fig. 2- Problem 1.2 Output)


Output
Clear

```
Employee Management System
1. Add an Employee
2. Display All Employees
3. Exit
Enter your choice: 1
Enter employee name: Anshika
Enter employee ID: 102
Enter employee designation: Director
Enter employee salary: 150000
Employee added successfully!

Employee Management System
1. Add an Employee
2. Display All Employees
3. Exit
Enter your choice: 2
Employee ID: 102, Name: Anshika, Designation: Director, Salary: $150000.0
Error reading from file: invalid type code: AC

Employee Management System
1. Add an Employee
2. Display All Employees
3. Exit
Enter your choice: 3
Exiting the application. Goodbye!

PS D:\Semester-6\PROJECT BASED LEARNING IN JAVA WITH LAB\PBLJ With Lab
```

(Fig. 3- Problem 1.3 Output)

5. Learning Outcome:

1. Developed skills in reading and writing data to files using FileInputStream, FileOutputStream, ObjectInputStream, and ObjectOutputStream.
2. Learned how to create interactive Java applications using a Scanner for user input, managing object persistence, and handling multiple operations through a structured menu.
3. Learned how Java automatically converts primitive data types into their

corresponding wrapper classes and vice versa, improving efficiency in data handling.