Experiment 5

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

Problem 1

1. **Aim:**

   Write a Java program to implement an ArrayList that stores employee details (ID, Name, and Salary). Allow users to add, update, remove, and search employees.

2. **Objective:**

   The Objective is to implement an ArrayList that stores employee details (ID, Name, and Salary) and allow users to add, update, remove, and search employees.

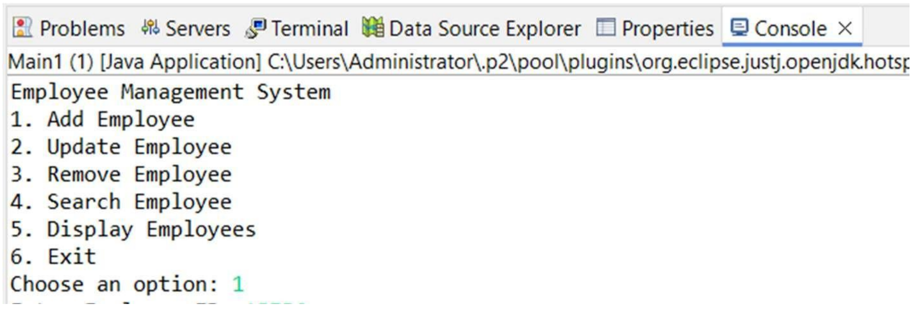
3. **Implementation/Code:**

```
import java.util.ArrayList;
import java.util.Scanner;

class Employee
   { int id;
   String name;
   double salary;
```

```
    Employee(int id, String name, double salary)
        { this.id = id;
        this.name = name;
        this.salary = salary;
    }
    @Override
    public String toString() {
        return "ID: " + id + ", Name: " + name + ", Salary: " + salary;
    }
}

public class Main {
    static ArrayList<Employee> employees = new ArrayList<>();
    static Scanner scanner = new Scanner(System.in);

    public static void addEmployee()
        { System.out.print("Enter Employee ID: ");
        int id = scanner.nextInt();
        scanner.nextLine();
        System.out.print("Enter Employee Name: ");
        String name = scanner.nextLine();
        System.out.print("Enter Employee Salary: ");
        double salary = scanner.nextDouble();
        employees.add(new Employee(id, name, salary));
        System.out.println("Employee added successfully!");
    }

    public static void updateEmployee()
        { System.out.print("Enter Employee ID to update: ");
        int id = scanner.nextInt();
        scanner.nextLine();
        for (Employee emp : employees) {
            if (emp.id == id)
                { System.out.print("Enter New Name:
                "); emp.name = scanner.nextLine();
                System.out.print("Enter New Salary: ");
                emp.salary = scanner.nextDouble();
                System.out.println("Employee details updated successfully!");
                return;
            }
        }
        System.out.println("Employee not found!");
    }

    public static void removeEmployee()
        { System.out.print("Enter Employee ID to remove:
        "); int id = scanner.nextInt();
        employees.removeIf(emp -> emp.id == id);
        System.out.println("Employee removed successfully!");
    }

    public static void searchEmployee()
        { System.out.print("Enter Employee ID to search: ");
        int id = scanner.nextInt();
        for (Employee emp : employees)
            { if (emp.id == id) {
                System.out.println(emp);
                return;
            }
        }
        System.out.println("Employee not found!");
    }

    public static void displayEmployees() {
        if (employees.isEmpty())
            { System.out.println("No employees found.");
        } else {
            for (Employee emp : employees)
                { System.out.println(emp);
            }
        }
    }

    public static void main(String[] args)
        { while (true) {
            System.out.println("\nEmployee Management System");
            System.out.println("1. Add Employee");
            System.out.println("2. Update Employee");
            System.out.println("3. Remove Employee");
            System.out.println("4. Search Employee");
            System.out.println("5. Display Employees");
            System.out.println("6. Exit");
            System.out.print("Choose an option: ");
            int choice = scanner.nextInt();

            switch (choice)
                { case 1:
                    addEmployee();
                    break;
                case 2:
                    updateEmployee();
                    break;
                case 3:
                    removeEmployee();
                    break;
                case 4:
```

```
                searchEmployee();
                break;
            case 5:
                displayEmployees();
                break;
            case 6:
                System.out.println("Exiting...");
                scanner.close();
                return;
            default:
                System.out.println("Invalid choice! Please try again.");
        }
      }
    }
  }
```

4. Output



```
Main1 (1) [Java Application] C:\Users\Administrator\.p2\pool\plugins\org.eclipse.justj.openjdk.hotsp
Employee Management System
1. Add Employee
2. Update Employee
3. Remove Employee
4. Search Employee
5. Display Employees
6. Exit
Choose an option: 1
```

5. Learning Outcomes

- Learn how to use ArrayList to store and manage employee details dynamically.
- Implement adding, updating, removing, and searching records efficiently.
- Use Java classes and objects to encapsulate employee details.

Problem 2

1. **Aim:**

   Create a program to collect and store all the cards to assist the users in finding all the cards in a given symbol using Collection interface.

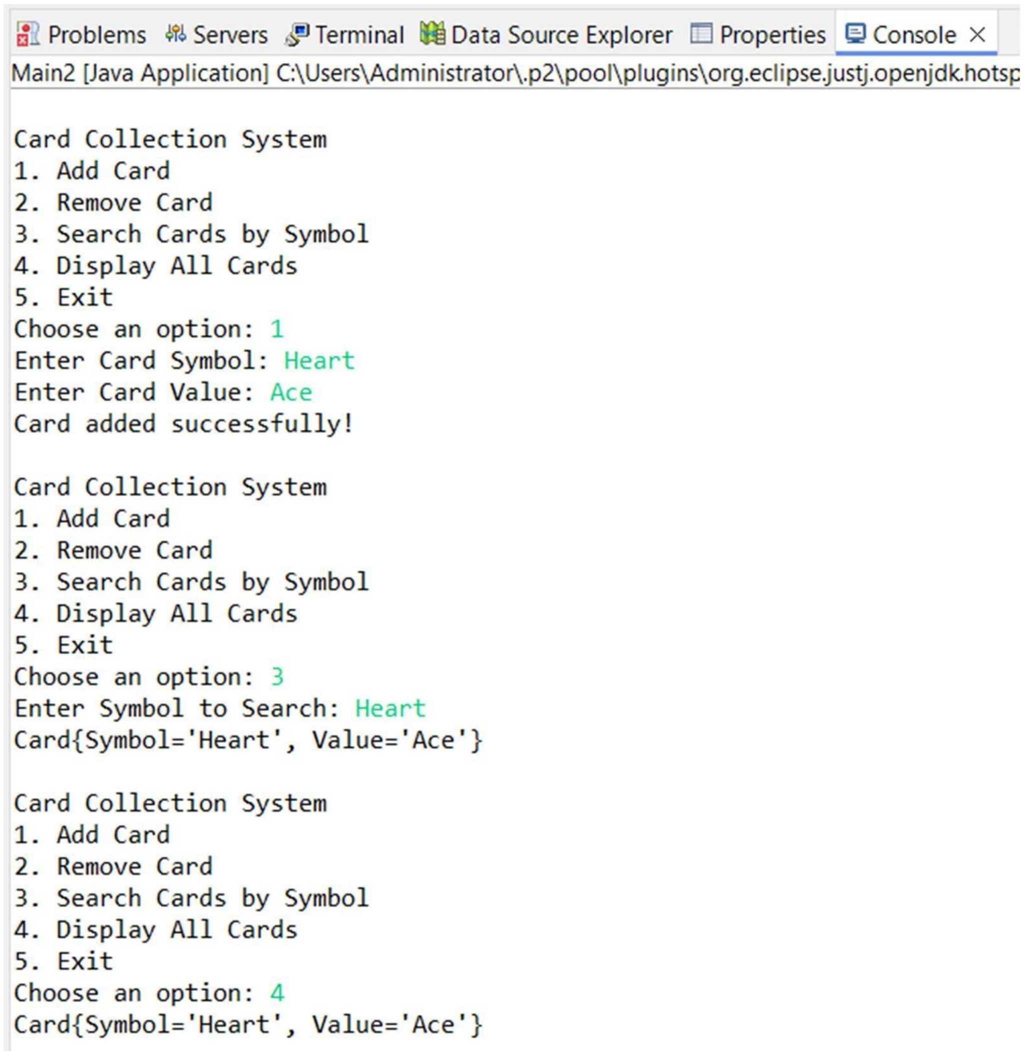
2. **Objective:**

   The Objective is to collect and store all the cards to assist the users in finding all the cards in a given symbol using Collection interface.

3. **Implementation/Code:**

```
package java1;
import java.util.*;

class Card {
   private String symbol;
   private String value;

   public Card(String symbol, String value)
      { this.symbol = symbol;
      this.value = value;
   }

   public String getSymbol()
      { return symbol;
   }

   public String getValue() {
        return value;
    }

    @Override
    public String toString() {
        return "Card{Symbol='" + symbol + "', Value='" + value + "'}";
    }
}
public class Main2 {
    private Collection<Card> cards;

    public Main2() {
        cards = new ArrayList<>();
    }
    public void addCard(String symbol, String value)
        { cards.add(new Card(symbol, value));
        System.out.println("Card added successfully!");
    }

    public void removeCard(String symbol, String value)
        { cards.removeIf(card -> card.getSymbol().equals(symbol) &&
card.getValue().equals(value));
        System.out.println("Card removed successfully!");
    }

    public void searchCardsBySymbol(String symbol)
        { boolean found = false;
        for (Card card : cards) {
            if (card.getSymbol().equals(symbol))
                { System.out.println(card);
                found = true;
            }
        }
        if (!found) {
            System.out.println("No cards found for the symbol: " + symbol);
        }
    }
    public void displayAllCards()
        { if (cards.isEmpty()) {
            System.out.println("No cards available.");
        } else {
            for (Card card : cards)
                { System.out.println(card);
            }
        }
    }
    public static void main(String[] args)
       { Scanner scanner = new
       Scanner(System.in); Main2 collection = new
       Main2();
        while (true) {
            System.out.println("\nCard Collection System");
            System.out.println("1. Add Card");
            System.out.println("2. Remove Card");
            System.out.println("3. Search Cards by Symbol");
            System.out.println("4. Display All Cards");
            System.out.println("5. Exit");
            System.out.print("Choose an option: ");
            int choice = scanner.nextInt();
            scanner.nextLine();

            switch (choice)
                { case 1:
                    System.out.print("Enter Card Symbol: ");
                    String symbol = scanner.nextLine();
                    System.out.print("Enter Card Value: ");
                    String value = scanner.nextLine();
                    collection.addCard(symbol, value);
                    break;
                case 2:
                    System.out.print("Enter Card Symbol to Remove: ");
                    String removeSymbol = scanner.nextLine();
                    System.out.print("Enter Card Value to Remove: ");
                    String removeValue = scanner.nextLine();
                    collection.removeCard(removeSymbol, removeValue);
                    break;
                case 3:
                    System.out.print("Enter Symbol to Search: ");
                    String searchSymbol = scanner.nextLine();
                    collection.searchCardsBySymbol(searchSymbol);
                    break;
                case 4:
                    collection.displayAllCards();
                    break;
                case 5:
                    System.out.println("Exiting...");
                    scanner.close();
                    return;
                default:
                    System.out.println("Invalid choice! Please try again.");
            }
        }
    }
  }
```

4. Output



Problems Servers Terminal Data Source Explorer Properties Console

```
Main2 [Java Application] C:\Users\Administrator\.p2\pool\plugins\org.eclipse.justj.openjdk.hotsp

Card Collection System
1. Add Card
2. Remove Card
3. Search Cards by Symbol
4. Display All Cards
5. Exit
Choose an option: 1
Enter Card Symbol: Heart
Enter Card Value: Ace
Card added successfully!

Card Collection System
1. Add Card
2. Remove Card
3. Search Cards by Symbol
4. Display All Cards
5. Exit
Choose an option: 3
Enter Symbol to Search: Heart
Card{Symbol='Heart', Value='Ace'}

Card Collection System
1. Add Card
2. Remove Card
3. Search Cards by Symbol
4. Display All Cards
5. Exit
Choose an option: 4
Card{Symbol='Heart', Value='Ace'}
```

5. Learning Outcomes

- Implement ArrayList for dynamic storage of card objects.
- Custom Class Implementation: Learn how to create and use custom classes (Card).
- Object-Oriented Programming (OOP): Apply encapsulation and class design principles.

Problem 3

1. Aim:

Develop a ticket booking system with synchronized threads to ensure no double booking of seats. Use thread priorities to simulate VIP bookings being processed first.

2. Objective:

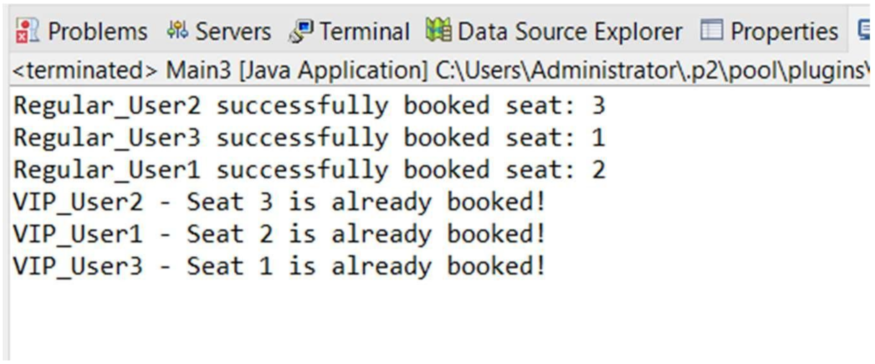
The Objective is to use thread priorities to simulate VIP bookings being processed first.

3. Implementation/Code:

```
package java1;
import java.util.*;

class TicketBookingSystem
  { private final int totalSeats;
  private final boolean[] seats;

  public TicketBookingSystem(int totalSeats)
    { this.totalSeats = totalSeats;
    this.seats = new boolean[totalSeats];
  }

  public synchronized boolean bookSeat(int seatNumber, String user)
    { if (seatNumber < 0 || seatNumber >= totalSeats) {
      System.out.println(user + " - Invalid seat number: " + seatNumber);
      return false;
    }
    if (!seats[seatNumber])
      { seats[seatNumber] = true;
      System.out.println(user + " successfully booked seat: " + seatNumber);
      return true;
    } else {
      System.out.println(user + " - Seat " + seatNumber + " is already booked!");
      return false;
    }
  }
}
```

```
class BookingThread extends Thread
    { private final TicketBookingSystem
    system; private final int seatNumber;

    public BookingThread(TicketBookingSystem system, int seatNumber, String user,
int priority) {
        super(user);
        this.system = system;
        this.seatNumber = seatNumber;
        setPriority(priority);
    }

    @Override
    public void run()
        { system.bookSeat(seatNumber,
        getName());
    }
}

public class Main3 {
    public static void main(String[] args) {
        TicketBookingSystem system = new TicketBookingSystem(5);

        List<BookingThread> threads = new ArrayList<>();
        threads.add(new BookingThread(system, 2, "VIP_User1",
Thread.MAX_PRIORITY));
        threads.add(new BookingThread(system, 2, "Regular_User1",
Thread.NORM_PRIORITY));
        threads.add(new BookingThread(system, 3, "VIP_User2",
Thread.MAX_PRIORITY));
        threads.add(new BookingThread(system, 3, "Regular_User2",
Thread.NORM_PRIORITY));
        threads.add(new BookingThread(system, 1, "VIP_User3",
Thread.MAX_PRIORITY));
        threads.add(new BookingThread(system, 1, "Regular_User3",
Thread.NORM_PRIORITY));

        Collections.shuffle(threads); // Simulate concurrent requests
        for (BookingThread thread : threads) {
            thread.start();
        }
    }
}
```

4. Output



```
<terminated> Main3 [Java Application] C:\Users\Administrator\.p2\pool\plugins\
Regular_User2 successfully booked seat: 3
Regular_User3 successfully booked seat: 1
Regular_User1 successfully booked seat: 2
VIP_User2 - Seat 3 is already booked!
VIP_User1 - Seat 2 is already booked!
VIP_User3 - Seat 1 is already booked!
```

5. Learning Outcomes

i. Use synchronized methods to prevent race conditions and ensure seat bookings are not duplicated.

ii. Assign priorities to threads (Thread.MAX_PRIORITY for VIP users) to control execution order.

iii. Learn how multiple threads can compete for shared resources.