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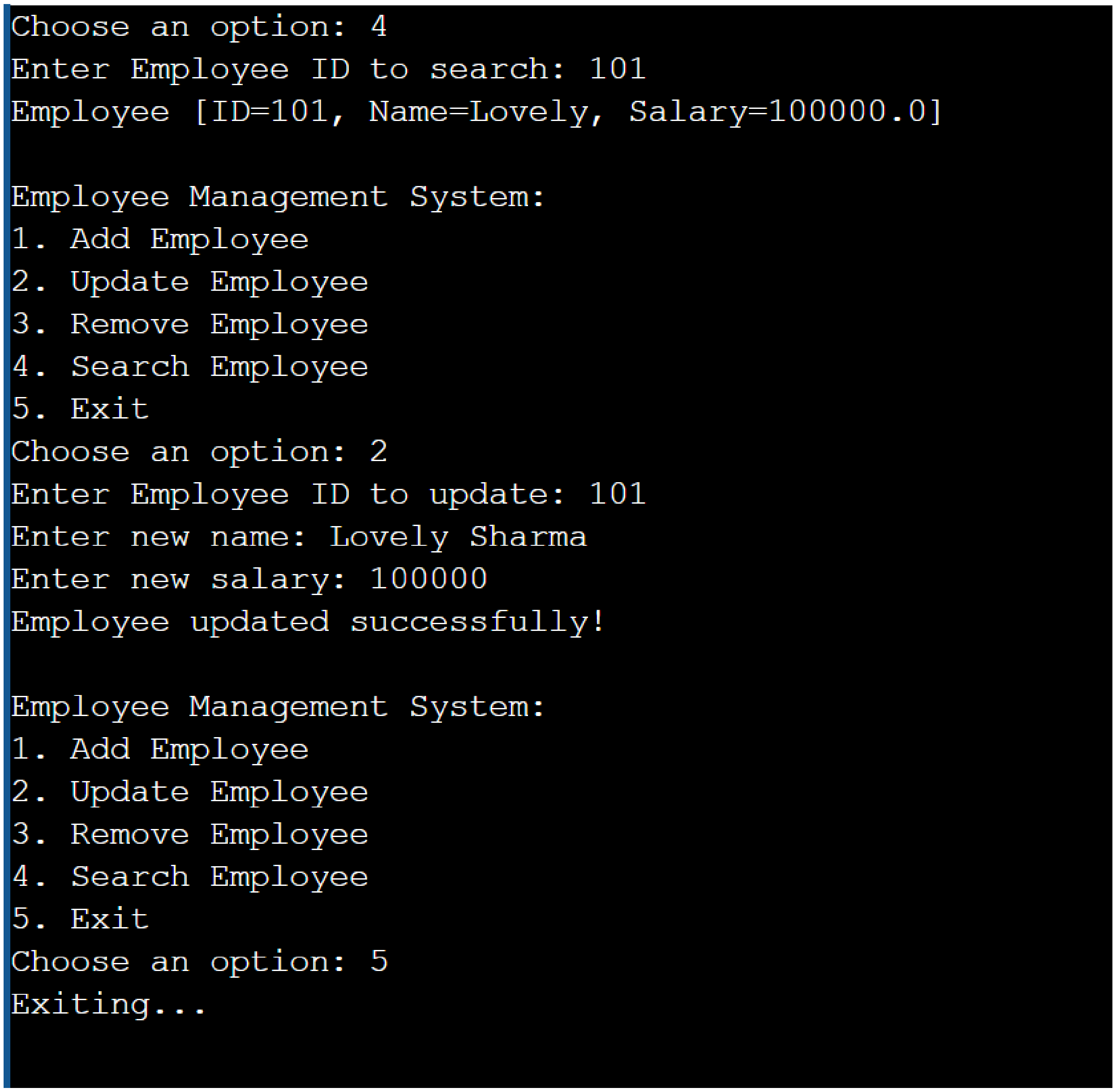
1. **Employee Management System (Easy):**
Write a Java program to implement an ArrayList that stores employee details (ID, Name, and Salary). Allow users to:
Add employees
Update employee details
Remove employees
Search for employees

a) **Code:**

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

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

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

    public int getId() {
        return id;
    }

    public String getName() {
        return name;
    }

    public double getSalary() {
        return salary;
    }

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

    public void setSalary(double salary) {
        this.salary = salary;
    }

    @Override
    public String toString() {
        return "Employee [ID=" + id + ", Name=" + name + ", Salary=" + salary + "]";
    }
}

public class EmployeeManagement {
    private static ArrayList<Employee> employees = new ArrayList<>();
    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 Employee");
            System.out.println("2. Update Employee");
            System.out.println("3. Remove Employee");
            System.out.println("4. Search Employee");
            System.out.println("5. 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:
                    System.out.println("Exiting...");
                    return;
                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 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!");
    }

    private static void updateEmployee() {
        System.out.print("Enter Employee ID to update: ");
        int id = scanner.nextInt();
        for (Employee emp : employees) {
            if (emp.getId() == id) {
                scanner.nextLine(); // Consume newline
                System.out.print("Enter new name: ");
                String name = scanner.nextLine();
                System.out.print("Enter new salary: ");
                double salary = scanner.nextDouble();
                emp.setName(name);
                emp.setSalary(salary);
                System.out.println("Employee updated successfully!");
                return;
            }
        }
        System.out.println("Employee not found.");
    }

    private static void removeEmployee() {
        System.out.print("Enter Employee ID to remove: ");
        int id = scanner.nextInt();
        for (Employee emp : employees) {
            if (emp.getId() == id) {
                employees.remove(emp);
                System.out.println("Employee removed successfully!");
                return;
            }
        }
        System.out.println("Employee not found.");
    }

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

b) Output:



```
Choose an option: 4
Enter Employee ID to search: 101
Employee [ID=101, Name=Lovely, Salary=100000.0]

Employee Management System:
1. Add Employee
2. Update Employee
3. Remove Employee
4. Search Employee
5. Exit
Choose an option: 2
Enter Employee ID to update: 101
Enter new name: Lovely Sharma
Enter new salary: 100000
Employee updated successfully!

Employee Management System:
1. Add Employee
2. Update Employee
3. Remove Employee
4. Search Employee
5. Exit
Choose an option: 5
Exiting...
```

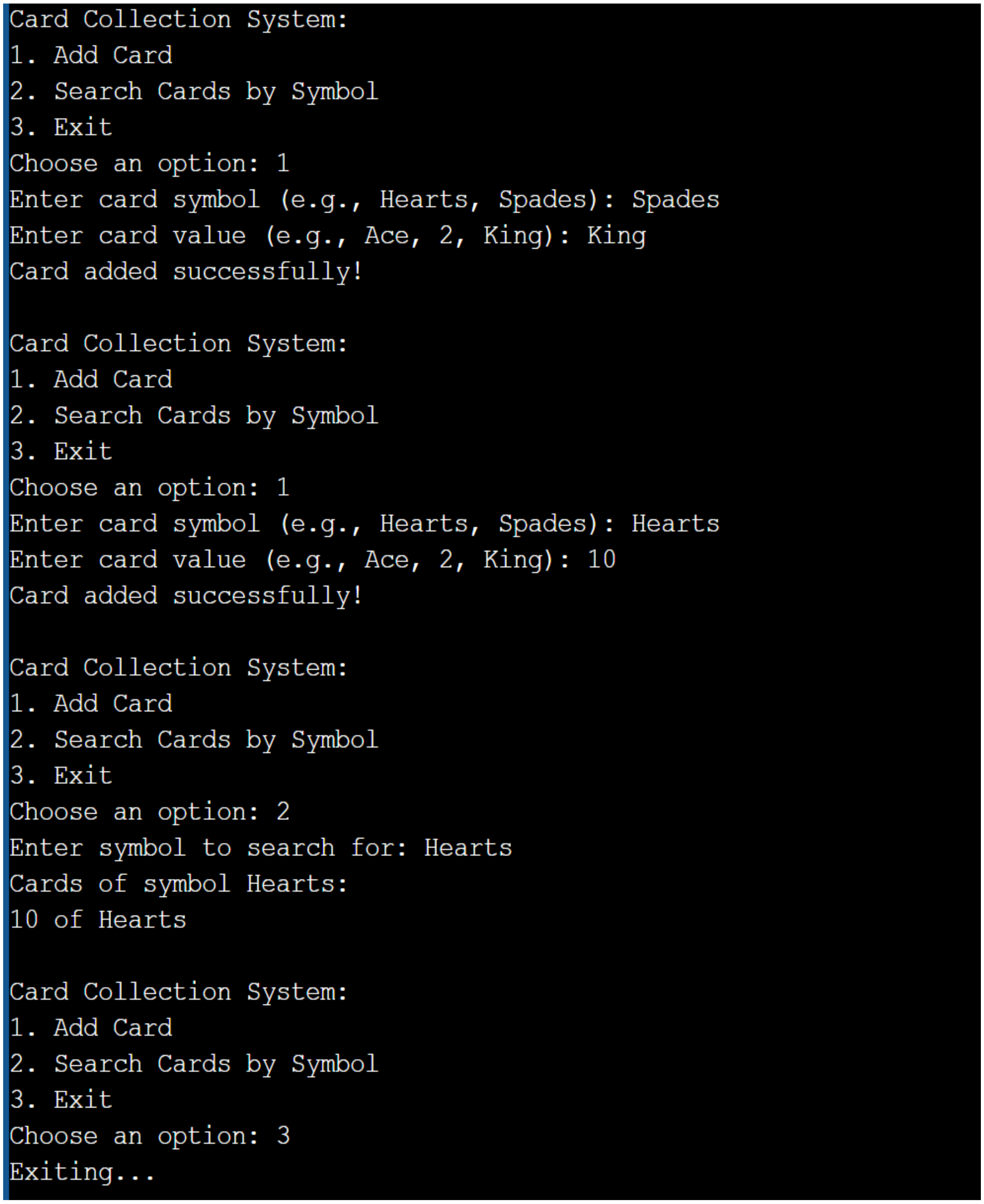
2. Card Collection System (Medium):

Create a program to collect and store all the cards (e.g., playing cards) and assist users in finding all the cards of a given symbol using the Collection interface.

a) Code:

```
import java.util.ArrayList;
import java.util.HashMap;
import java.util.List;
import java.util.Map;
import java.util.Scanner;

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 value + " of " + symbol;
    }
}

public class CardCollection {
    private static Map<String, List<Card>> cardMap = new HashMap<>();
    private static Scanner scanner = new Scanner(System.in);

    public static void main(String[] args) {
        while (true) {
            System.out.println("\nCard Collection System:");
            System.out.println("1. Add Card");
            System.out.println("2. Search Cards by Symbol");
            System.out.println("3. Exit");
            System.out.print("Choose an option: ");

            int choice = scanner.nextInt();
            scanner.nextLine(); // Consume newline
            switch (choice) {
                case 1:
                    addCard();
                    break;
                case 2:
                    searchCardsBySymbol();
                    break;
                case 3:
                    System.out.println("Exiting...");
                    return;
                default:
                    System.out.println("Invalid choice. Try again.");
            }
        }
    }

    private static void addCard() {
        System.out.print("Enter card symbol (e.g., Hearts, Spades): ");
        String symbol = scanner.nextLine();
        System.out.print("Enter card value (e.g., Ace, 2, King): ");
        String value = scanner.nextLine();

        Card card = new Card(symbol, value);
        cardMap.computeIfAbsent(symbol, k -> new ArrayList<>()).add(card);
        System.out.println("Card added successfully!");
    }

    private static void searchCardsBySymbol() {
        System.out.print("Enter symbol to search for: ");
        String symbol = scanner.nextLine();

        List<Card> cards = cardMap.get(symbol);
        if (cards != null && !cards.isEmpty()) {
            System.out.println("Cards of symbol " + symbol + ":");
            for (Card card : cards) {
                System.out.println(card);
            }
        } else {
            System.out.println("No cards found for symbol: " + symbol);
        }
    }

}
```

b) Output:



```
Card Collection System:
1. Add Card
2. Search Cards by Symbol
3. Exit
Choose an option: 1
Enter card symbol (e.g., Hearts, Spades): Spades
Enter card value (e.g., Ace, 2, King): King
Card added successfully!

Card Collection System:
1. Add Card
2. Search Cards by Symbol
3. Exit
Choose an option: 1
Enter card symbol (e.g., Hearts, Spades): Hearts
Enter card value (e.g., Ace, 2, King): 10
Card added successfully!

Card Collection System:
1. Add Card
2. Search Cards by Symbol
3. Exit
Choose an option: 2
Enter symbol to search for: Hearts
Cards of symbol Hearts:
10 of Hearts

Card Collection System:
1. Add Card
2. Search Cards by Symbol
3. Exit
Choose an option: 3
Exiting...
```

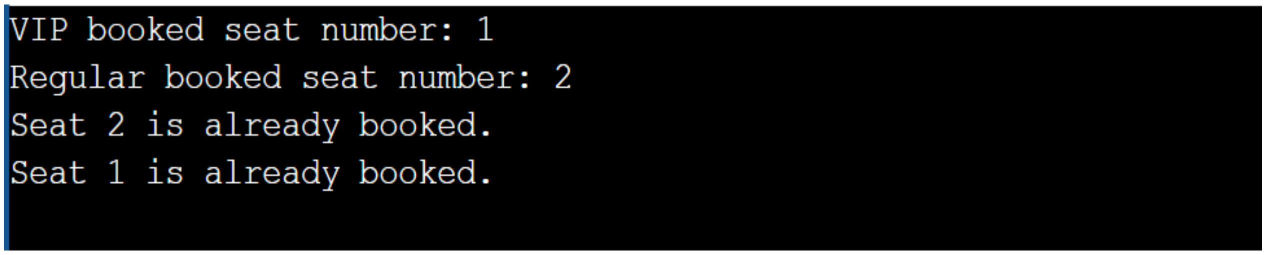
3. Ticket Booking System with Multithreading:

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.

a) Code:

```
import java.util.HashSet;
import java.util.Set;

class TicketBookingSystem {
   private final Set<Integer> bookedSeats = new HashSet<>();

   public synchronized void bookSeat(int seatNumber, String customerType) {
      if (bookedSeats.add(seatNumber)) {
         System.out.println(customerType + " booked seat number: " + seatNumber);
      } else {
         System.out.println("Seat " + seatNumber + " is already booked.");
      }
   }
}
class BookingThread extends Thread {
   private final TicketBookingSystem system;
   private final int seatNumber;
   private final String customerType;

   public BookingThread(TicketBookingSystem system, int seatNumber, String
customerType) {
      this.system = system;
      this.seatNumber = seatNumber;
      this.customerType = customerType;
   }

   @Override
   public void run() {
      system.bookSeat(seatNumber, customerType);
   }
}
public class Main {
   public static void main(String[] args) {
      TicketBookingSystem system = new TicketBookingSystem();

      new BookingThread(system, 1, "VIP").start();
      new BookingThread(system, 1, "Regular").start();
      new BookingThread(system, 2, "VIP").start();
      new BookingThread(system, 2, "Regular").start();
   }
}
```

b) Output:



```
VIP booked seat number: 1
Regular booked seat number: 2
Seat 2 is already booked.
Seat 1 is already booked.
```