Experiment 4

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Subject: Java **Subject Code:22CSH-359**

Code 1:

Aim: Develop Java programs using core concepts such as data structures, collections, and multithreading to manage and manipulate data.

Objective: 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.

Algorithm:

1.) Define Data Structure:
- Create an Employee class/structure with:
- Integer id
- String name
- Double salary

2.) Initialize Data Storage:
- Create an empty list (e.g., ArrayList<Employee>) to hold employee objects.

3.) Main Loop:
- Repeat until the user chooses to exit: 1) Display Menu Options:
- "1. Add Employee"
- "2. Update Employee"
- "3. Remove Employee"
- "4. Search Employee"
- "5. Display All Employees"
- "0. Exit"

2) **Input Choice**:
- Read the user's menu option (e.g., as an integer).

4.) Process User Choice:
- **If** choice is **1 (Add Employee):**

1. Prompt the user to enter Employee ID.
2. Prompt the user to enter Employee Name.
3. Prompt the user to enter Employee Salary.

4. Create a new Employee object with the provided details.
5. Add the new employee to the list.
6. Display a success message.

• **If** choice is **2 (Update Employee):**

1. Prompt the user to enter the Employee ID to update.
2. Search for the employee in the list using the given ID.
3. If the employee exists:
    - Prompt the user to enter the new Name.
    - Prompt the user to enter the new Salary.
    - Update the employee's name and salary.
    - Display a success message.
4. **Else**:
    - Display a "not found" message.
    - **If** choice is **3 (Remove Employee):**

1. Prompt the user to enter the Employee ID to remove.
2. Search for the employee in the list using the given ID.
3. If the employee exists:
    - Remove the employee from the list.
    - Display a success message.
4. **Else**:
    - Display a "not found" message.
    - **If** choice is **4 (Search Employee):**

1. Prompt the user to enter the Employee ID to search.
2. Search for the employee in the list using the given ID.
3. If the employee exists:
    - Display the employee's details.
4. **Else**:
    - Display a "not found" message.
    - **If** choice is **5 (Display All Employees):**

1. If the employee list is empty:
    - Display a message indicating no employees to show.
2. **Else**:
    - Iterate over the list and display each employee's details.
    - **If** the choice is **0 (Exit):**
    - Terminate the program loop.

5.) End Program

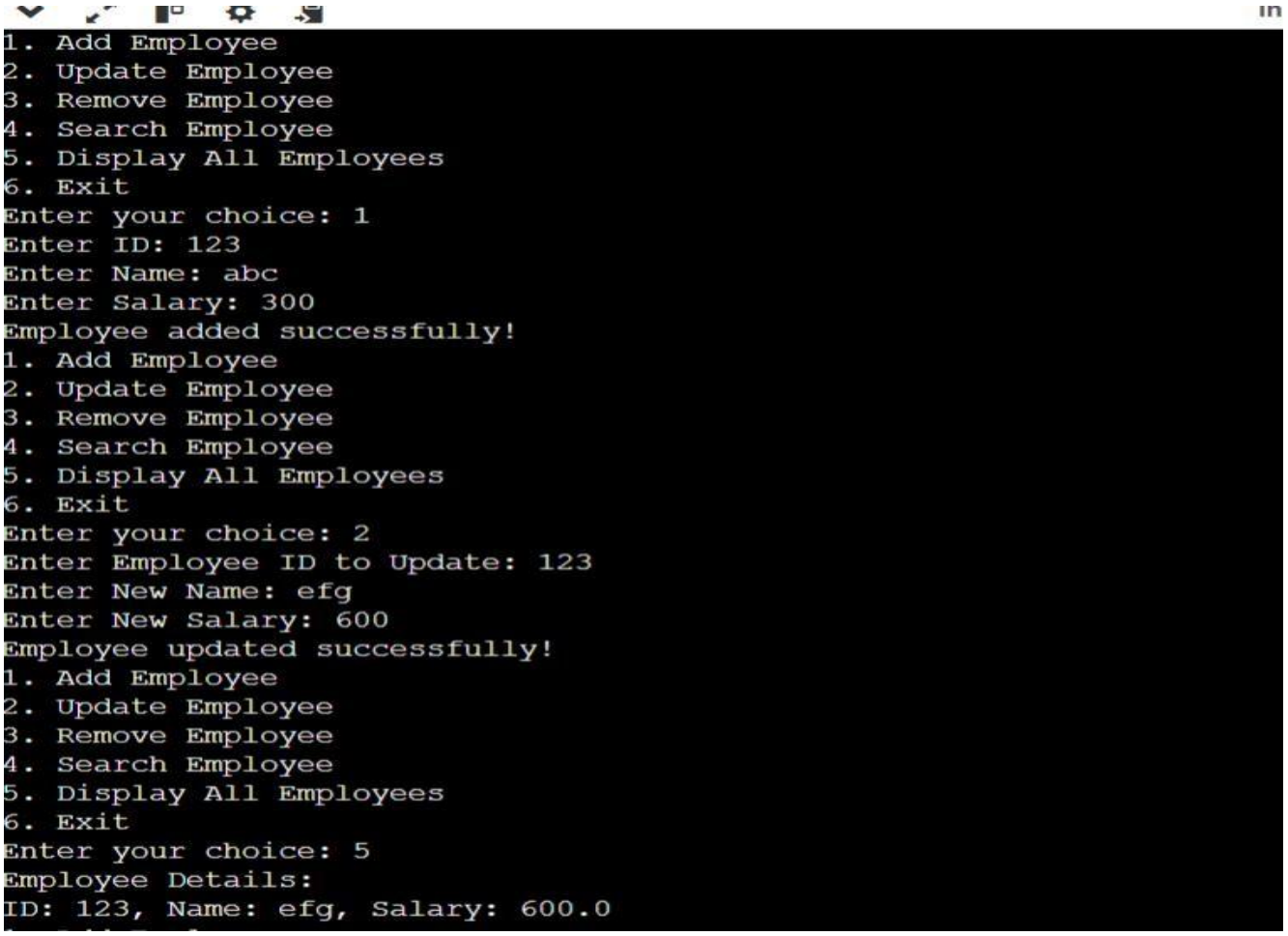
Code:

```
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;
}

public String toString() {
return "ID: " + id + ", Name: " + name + ", Salary: " + salary;
}
}

public class classwork3 {
public static void main(String[] args) {
ArrayList<Employee> employees = new ArrayList<>();
Scanner scanner = new Scanner(System.in);
int choice;
do {
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 All Employees");
System.out.println("6. Exit");
System.out.print("Enter your choice: ");
choice = scanner.nextInt();

switch (choice) {
case 1:
System.out.print("Enter ID: ");
int id = scanner.nextInt();
System.out.print("Enter Name: ");
String name = scanner.next();
System.out.print("Enter Salary: ");
double salary = scanner.nextDouble();
employees.add(new Employee(id, name, salary));
System.out.println("Employee added successfully!");
break;
case 2:
System.out.print("Enter Employee ID to Update: ");
int updateId = scanner.nextInt();
```

```
boolean found = false;
for (Employee emp : employees) {
if (emp.id == updateId) {
System.out.print("Enter New Name: ");
emp.name = scanner.next();
System.out.print("Enter New Salary: ");
emp.salary = scanner.nextDouble();
System.out.println("Employee updated successfully!");
found = true;
break;
}
}
if (!found) {
System.out.println("Employee not found!");
}
break;
case 3:
// Remove Employee
System.out.print("Enter Employee ID to Remove: ");
int removeId = scanner.nextInt();
found = false;
for (Employee emp : employees) {
if (emp.id == removeId) {
employees.remove(emp);
System.out.println("Employee removed successfully!");
found = true;
break;
}
}
if (!found) {
System.out.println("Employee not found!");
}
break;
case 4:
System.out.print("Enter Employee ID to Search: ");
int searchId = scanner.nextInt();
found = false;
for (Employee emp : employees) {
if (emp.id == searchId) {
System.out.println(emp);
found = true;
break;
}
}
if (!found) {
System.out.println("Employee not found!");
}
break;
```

```
case 5:
System.out.println("Employee Details:");
for (Employee emp : employees) {
System.out.println(emp);
}
break;
case 6:
System.out.println("Exiting...");
break;
default:
System.out.println("Invalid choice! Please try again.");
}
} while (choice != 6);

scanner.close();
}
}
```

Output:



Code 2:

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.

Objective: Develop Java programs using core concepts such as data structures, collections, and multithreading to manage and manipulate data.

Algorithm:

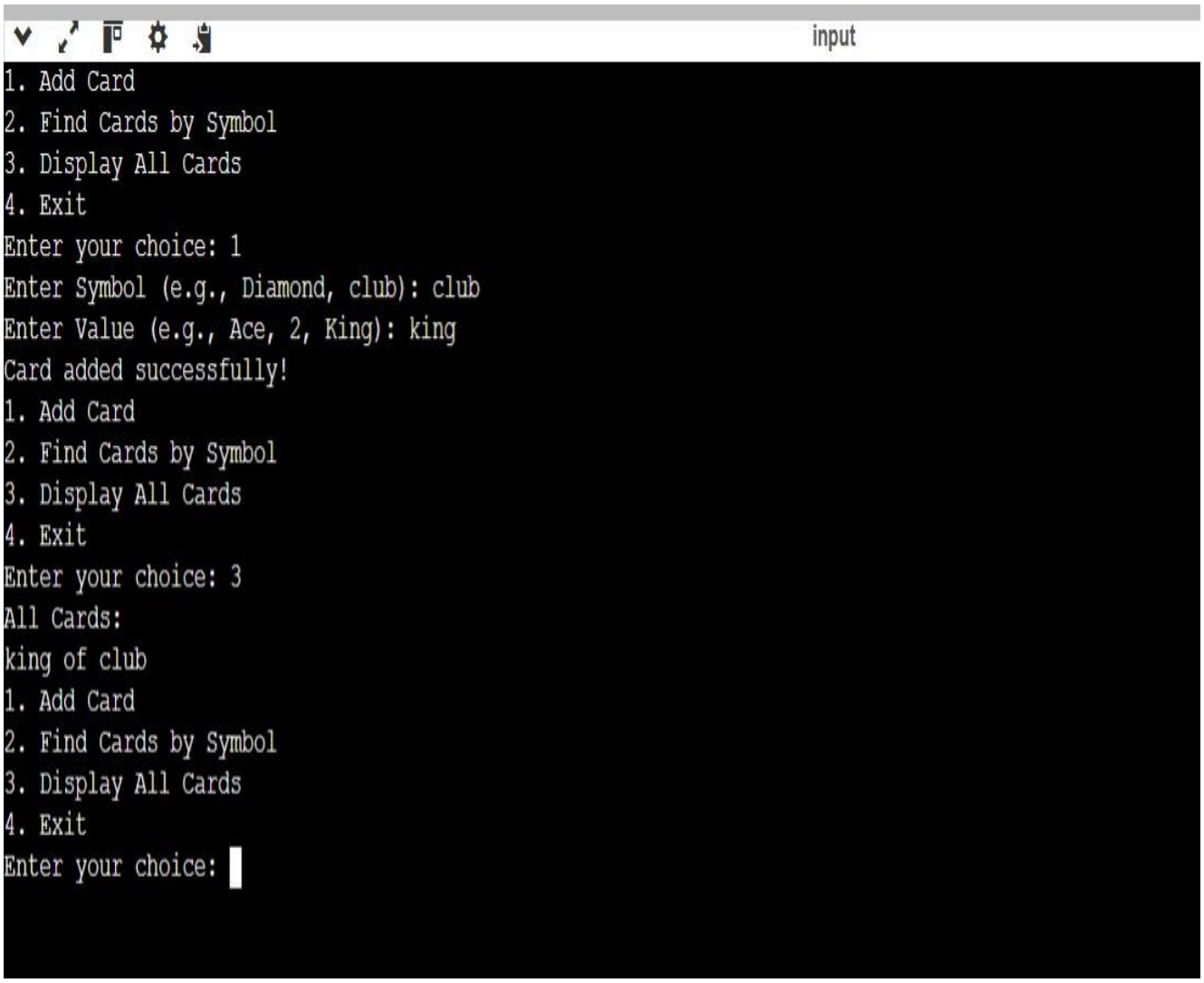
- **Create a Card Class:**
  - Define attributes: symbol and value.
  - Implement a constructor to initialize these attributes.
  - Override the toString() method to display card details**.**
- **Create a CardManager Class:**
  - Define a List<Card> to store the cards.
  - Implement methods for adding a card, finding cards by symbol, and displaying all cards.
- **Main Method:**
  - Initialize a Scanner for user input.
  - Display a menu with options to add a card, find cards by symbol, display all cards, and exit.
  - Use a do-while loop to handle user input and call the appropriate methods based on the user's choice.

Code:

```
import java.util.ArrayList;
import java.util.List;
import java.util.Scanner;
class Card {
String symbol;
String value;

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

public String toString() {
return value + " of " + symbol;
}
}

public class classwork3 {
public static void main(String[] args) {
List<Card> cards = new ArrayList<>();
Scanner scanner = new Scanner(System.in);
```

```
int choice;
do {
System.out.println("1. Add Card");
System.out.println("2. Find Cards by Symbol");
System.out.println("3. Display All Cards");
System.out.println("4. Exit");
System.out.print("Enter your choice: ");
choice = scanner.nextInt();

switch (choice) {
case 1:
System.out.print("Enter Symbol (e.g., Hearts, Diamonds): ");
String symbol = scanner.next();
System.out.print("Enter Value (e.g., Ace, 2, King): ");
String value = scanner.next();
cards.add(new Card(symbol, value));
System.out.println("Card added successfully!");
break;
case 2:
System.out.print("Enter Symbol to Search: ");
String searchSymbol = scanner.next();
System.out.println("Cards with symbol " + searchSymbol + ":");
for (Card card : cards) {
if (card.symbol.equalsIgnoreCase(searchSymbol)) {
System.out.println(card);
}
}
break;
case 3:
System.out.println("All Cards:");
for (Card card : cards) {
System.out.println(card);
}
break;
case 4:
System.out.println("Exiting...");
break;
default:
System.out.println("Invalid choice! Please try again.");
}
} while (choice != 4);

scanner.close();
}
}
```

Output:


input
1. Add Card
2. Find Cards by Symbol
3. Display All Cards
4. Exit
Enter your choice: 1
Enter Symbol (e.g., Diamond, club): club
Enter Value (e.g., Ace, 2, King): king
Card added successfully!
1. Add Card
2. Find Cards by Symbol
3. Display All Cards
4. Exit
Enter your choice: 3
All Cards:
king of club
1. Add Card
2. Find Cards by Symbol
3. Display All Cards
4. Exit
Enter your choice:

Code 3:

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.

Objective: Develop Java programs using core concepts such as data structures, collections, and multithreading to manage and manipulate dat

Algorithm:

- **Define Seat Class:**
  - Create a class Seat with attributes seatNumber and isBooked.
  - Implement a constructor to initialize seatNumber and set isBooked to false.
  - Implement methods getSeatNumber(), isBooked(), and bookSeat().
- **Define BookingSystem Class:**
  - Create a class BookingSystem with an array of Seat objects.
  - Implement a constructor to initialize the array with a specified number of seats.
  - Implement a synchronized method bookSeat(int seatNumber):
    - Check if the seat is already booked.
    - If not, mark the seat as booked and return true.
    - If yes, return false.
- **Create BookingThread Class:**
  - Create a class BookingThread that extends Thread.
  - Include attributes for BookingSystem and seatNumber.
  - Implement a constructor to initialize these attributes and set the thread name and priority.
  - Override the run() method to call the bookSeat(int seatNumber) method of BookingSystem.
- **Main Method:**
  - Initialize the BookingSystem with a specified number of seats.
  - Create multiple BookingThread instances for VIP and regular bookings with different priorities.
  - Start the booking threads.

Code:

```
class Seat {
    private int seatNumber;
    private boolean isBooked;

    public Seat(int seatNumber) {
        this.seatNumber = seatNumber;
        this.isBooked = false;
    }

    public int getSeatNumber() {
        return seatNumber;
    }

    public boolean isBooked() {
```

```
        return isBooked;
    }

    public void bookSeat() {
        this.isBooked = true;
    }
}

class BookingSystem {
    private Seat[] seats;

    public BookingSystem(int numberOfSeats) {
        seats = new Seat[numberOfSeats];
        for (int i = 0; i < numberOfSeats; i++) {
            seats[i] = new Seat(i + 1);
        }
    }

    public synchronized boolean bookSeat(int seatNumber) {
        if (!seats[seatNumber - 1].isBooked()) {
            seats[seatNumber - 1].bookSeat();
            System.out.println("Seat " + seatNumber + " booked successfully by " +
Thread.currentThread().getName());
            return true;
        } else {
            System.out.println("Seat " + seatNumber + " is already booked.");
            return false;
        }
    }
}

class BookingThread extends Thread {
    private BookingSystem bookingSystem;
    private int seatNumber;

    public BookingThread(BookingSystem bookingSystem, int seatNumber, String name, int
priority) {
        super(name);
        this.bookingSystem = bookingSystem;
        this.seatNumber = seatNumber;
        setPriority(priority);
    }

    public void run() {
        bookingSystem.bookSeat(seatNumber);
    }
}
```

```
public class BookingSimulation {
    public static void main(String[] args) {
        BookingSystem bookingSystem = new BookingSystem(5);

        BookingThread vip1 = new BookingThread(bookingSystem, 1, "VIP-1",
Thread.MAX_PRIORITY);
        BookingThread vip2 = new BookingThread(bookingSystem, 2, "VIP-2",
Thread.MAX_PRIORITY);
        BookingThread user1 = new BookingThread(bookingSystem, 1, "User-1",
Thread.NORM_PRIORITY);
        BookingThread user2 = new BookingThread(bookingSystem, 2, "User-2",
Thread.NORM_PRIORITY);
        BookingThread user3 = new BookingThread(bookingSystem, 3, "User-3",
Thread.MIN_PRIORITY);
        BookingThread user4 = new BookingThread(bookingSystem, 4, "User-4",
Thread.MIN_PRIORITY);

        vip1.start();
        vip2.start();
        user1.start();
        user2.start();
        user3.start();
        user4.start();
    }
}
```

Output:

```
input
Seat 1 booked successfully by VIP-1
Seat 2 booked successfully by User-2
Seat 4 booked successfully by User-4
Seat 3 booked successfully by User-3
Seat 1 is already booked.
Seat 2 is already booked.


...Program finished with exit code 0
Press ENTER to exit console.
```

Learning Outcomes:

1. Demonstrate: Apply key concepts to real-world scenarios to showcase understanding.
2. Analyze: Critically evaluate information, identify patterns, and draw meaningful conclusions.
3. Create: Develop original work, including presentations, reports, or projects, to exhibit comprehension and skills.