# 10.a) Cryptocurrency Transaction Ledger

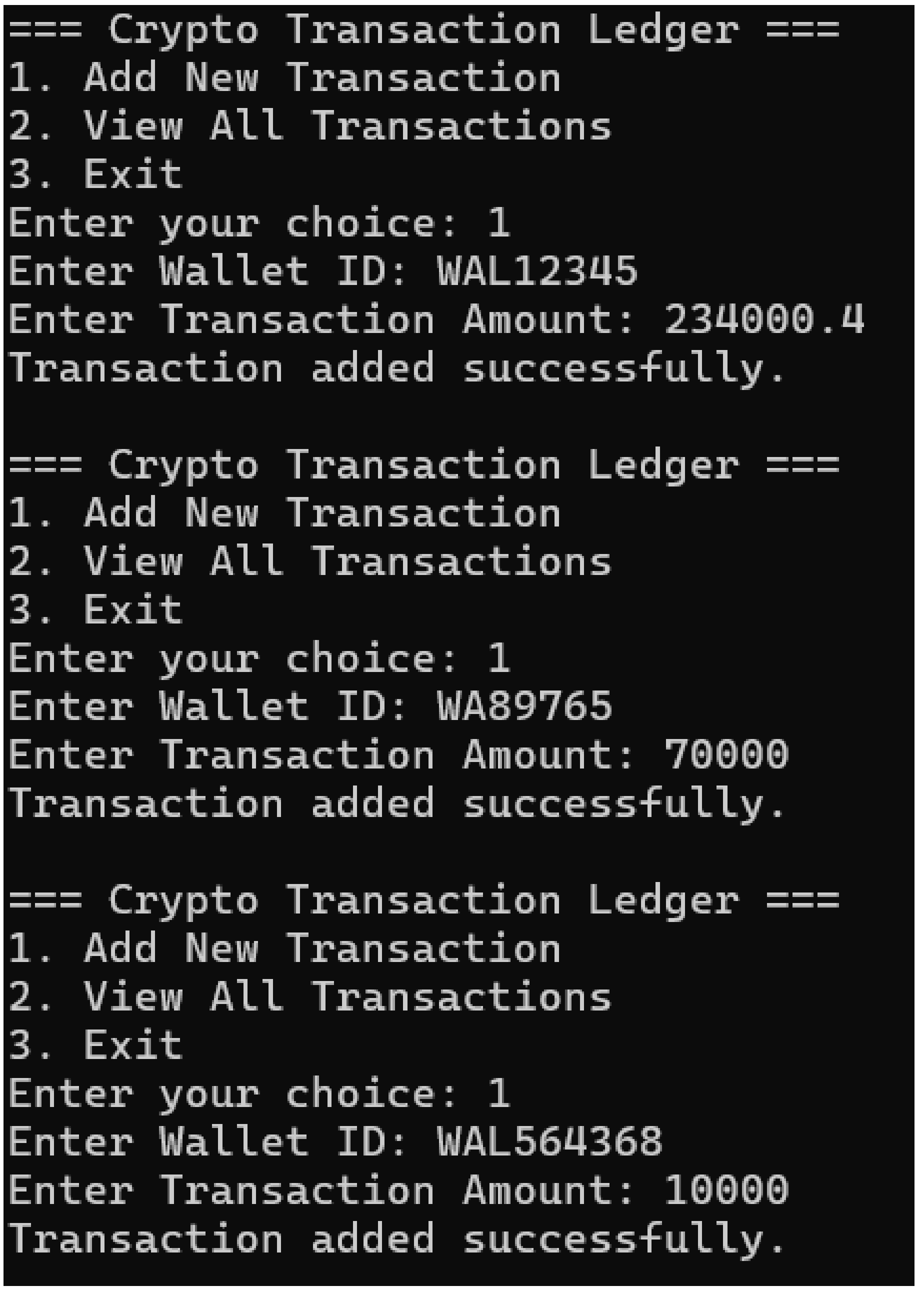
## Code :

```
import java.io.*;
import java.util.*;
import java.time.LocalDateTime;
import java.time.format.DateTimeFormatter;

// CryptoTransaction class implementing Serializable
class CryptoTransaction implements Serializable {
   private String walletID;
   private double transactionAmount;
   private String timestamp;
   public CryptoTransaction(String walletID, double transactionAmount) {
      this.walletID = walletID;
      this.transactionAmount = transactionAmount;
      this.timestamp = getCurrentTimestamp();
   }
   private String getCurrentTimestamp() {
      DateTimeFormatter formatter = DateTimeFormatter.ofPattern("yyyy-MM-dd HH:mm:ss");
      return LocalDateTime.now().format(formatter);
   }
   public String toString() {
      return "Wallet ID: " + walletID + ", Amount: " + transactionAmount + ", Timestamp: " +
timestamp;
   }
}

public class CryptoLedgerList {

   static final String FILE_NAME = "transactions_list.dat";
   // Method to add a transaction to the file
   public static void addTransaction(CryptoTransaction transaction) {
      ArrayList<CryptoTransaction> transactions = readTransactions();
      transactions.add(transaction);
      saveTransactions(transactions);
      System.out.println("Transaction added successfully.\n");
   }
   // Method to save the transaction list to file
   public static void saveTransactions(ArrayList<CryptoTransaction> transactions) {
      try (ObjectOutputStream oos = new ObjectOutputStream(new FileOutputStream(FILE_NAME)))
{
         oos.writeObject(transactions);
      } catch (IOException e) {
         e.printStackTrace();
      }
   }
```

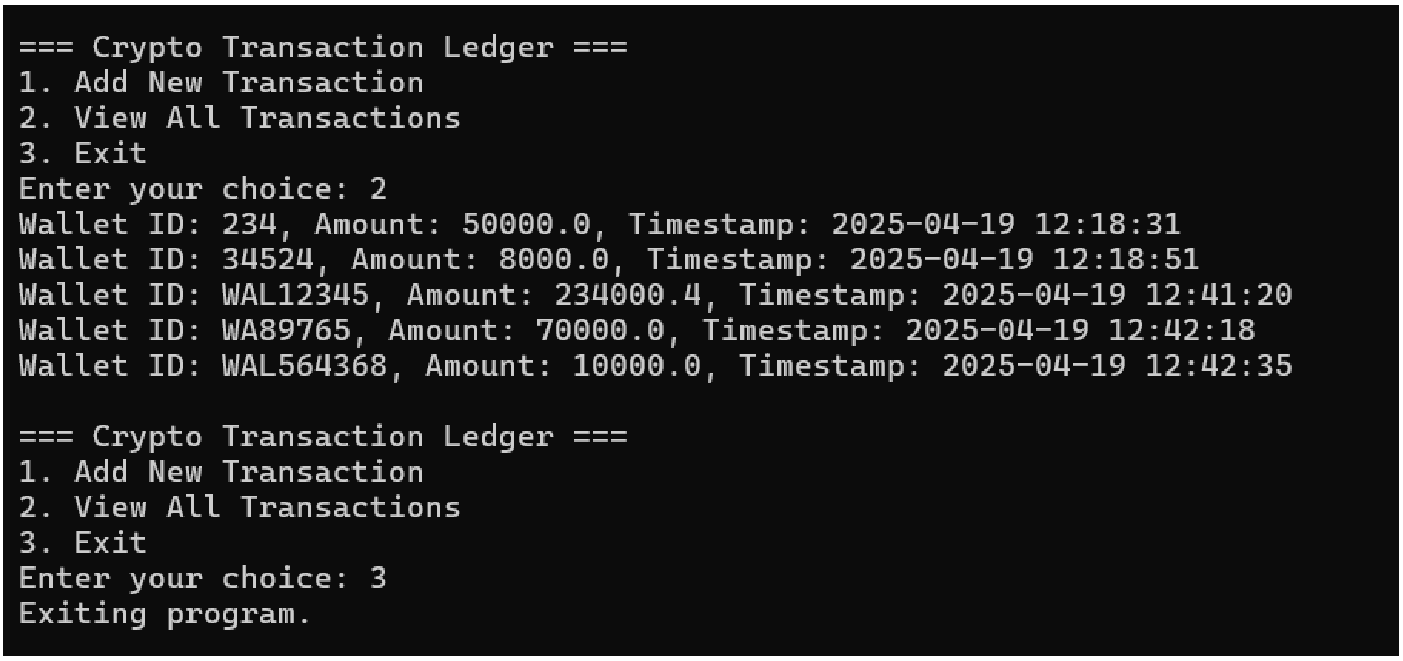
```
// Method to read all transactions from file
public static ArrayList<CryptoTransaction> readTransactions() {
    ArrayList<CryptoTransaction> transactions = new ArrayList<>();
    try (ObjectInputStream ois = new ObjectInputStream(new FileInputStream(FILE_NAME))) {
        transactions = (ArrayList<CryptoTransaction>) ois.readObject();
    } catch (FileNotFoundException e) {
        // Ignore if file doesn't exist yet
    } catch (IOException | ClassNotFoundException e) {
        e.printStackTrace();
    }
    return transactions;
}

// Method to display all transactions
public static void displayTransactions() {
    ArrayList<CryptoTransaction> transactions = readTransactions();
    if (transactions.isEmpty()) {
        System.out.println("No transactions found.\n");
    } else {
        for (CryptoTransaction t : transactions) {
            System.out.println(t);
        }
        System.out.println();
    }
}
public static void main(String[] args) {
    Scanner sc = new Scanner(System.in);
    int choice;
    do {
        System.out.println("=== Crypto Transaction Ledger ===");
        System.out.println("1. Add New Transaction");
        System.out.println("2. View All Transactions");
        System.out.println("3. Exit");
        System.out.print("Enter your choice: ");
        choice = sc.nextInt();
        sc.nextLine(); // Consume newline
        switch (choice) {
            case 1:
                System.out.print("Enter Wallet ID: ");
                String walletID = sc.nextLine();
                System.out.print("Enter Transaction Amount: ");
                double amount = sc.nextDouble();
                CryptoTransaction transaction = new CryptoTransaction(walletID, amount);
                addTransaction(transaction);
                break;

            case 2:
                displayTransactions();
```

```
                    break;

                case 3:
                    System.out.println("Exiting program.");
                    break;

                default:
                    System.out.println("Invalid choice! Try again.");
            }

        } while (choice != 3);

        sc.close();
    }
}
```

**Output:**



```
=== Crypto Transaction Ledger ===
1. Add New Transaction
2. View All Transactions
3. Exit
Enter your choice: 1
Enter Wallet ID: WAL12345
Enter Transaction Amount: 234000.4
Transaction added successfully.

=== Crypto Transaction Ledger ===
1. Add New Transaction
2. View All Transactions
3. Exit
Enter your choice: 1
Enter Wallet ID: WA89765
Enter Transaction Amount: 70000
Transaction added successfully.

=== Crypto Transaction Ledger ===
1. Add New Transaction
2. View All Transactions
3. Exit
Enter your choice: 1
Enter Wallet ID: WAL564368
Enter Transaction Amount: 10000
Transaction added successfully.
```



```
=== Crypto Transaction Ledger ===
1. Add New Transaction
2. View All Transactions
3. Exit
Enter your choice: 2
Wallet ID: 234, Amount: 50000.0, Timestamp: 2025-04-19 12:18:31
Wallet ID: 34524, Amount: 8000.0, Timestamp: 2025-04-19 12:18:51
Wallet ID: WAL12345, Amount: 234000.4, Timestamp: 2025-04-19 12:41:20
Wallet ID: WA89765, Amount: 70000.0, Timestamp: 2025-04-19 12:42:18
Wallet ID: WAL564368, Amount: 10000.0, Timestamp: 2025-04-19 12:42:35

=== Crypto Transaction Ledger ===
1. Add New Transaction
2. View All Transactions
3. Exit
Enter your choice: 3
Exiting program.
```

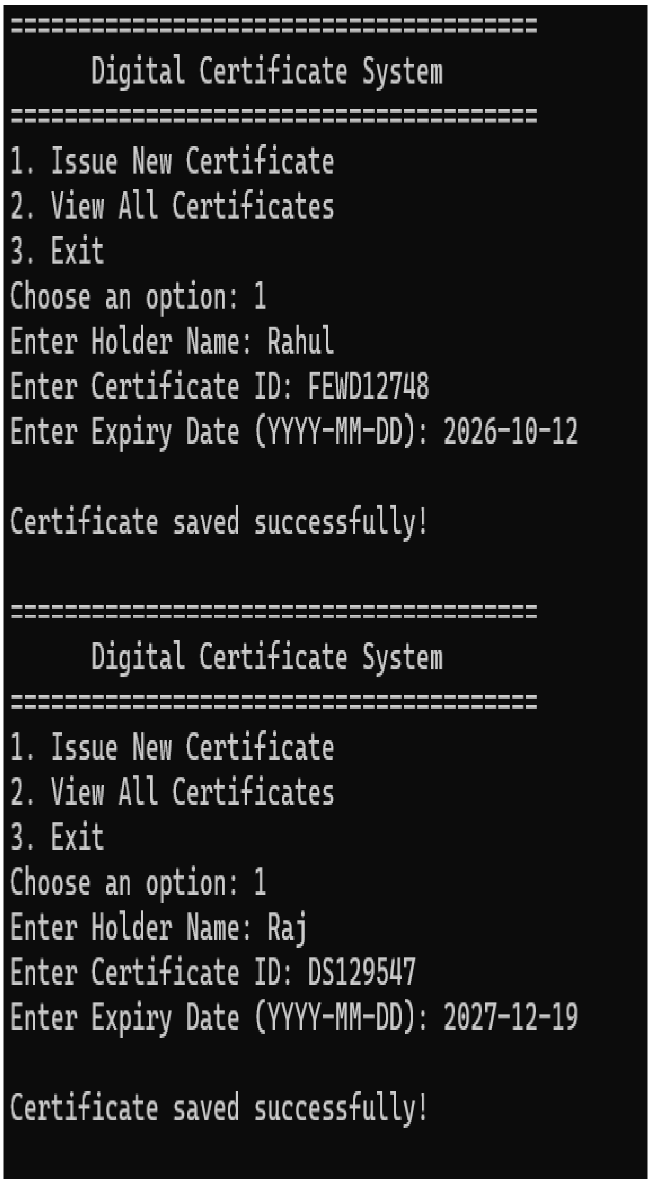
## 10.b) Digital Certificate Management System

**Code :**

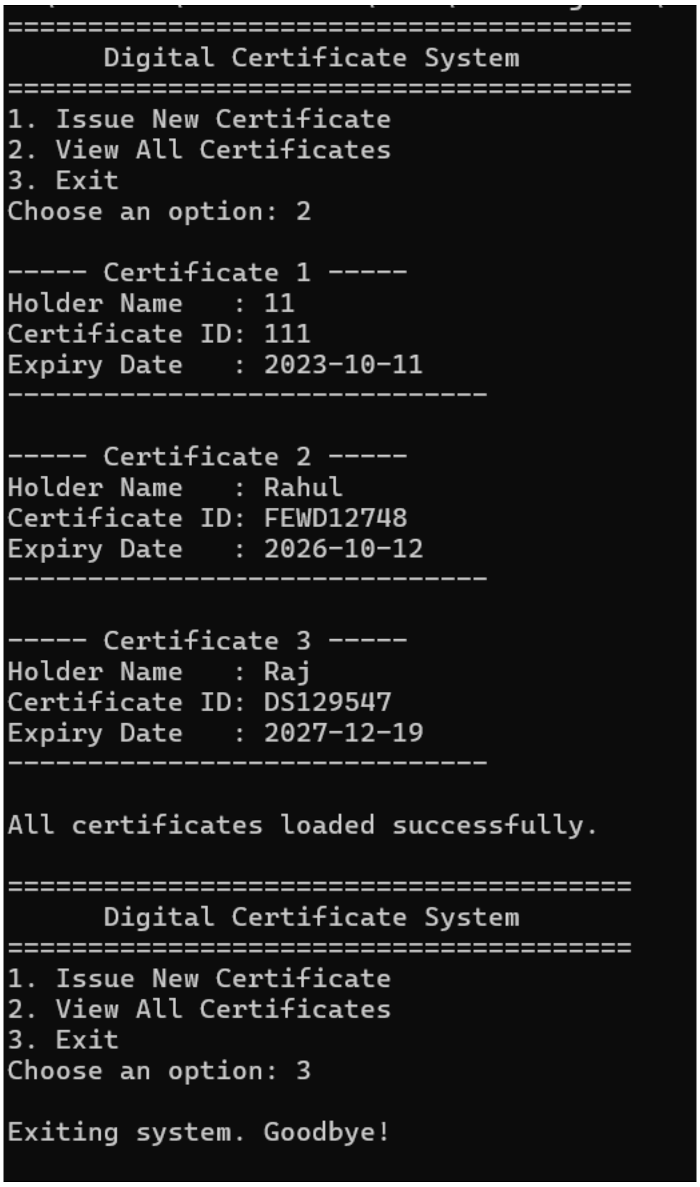
```
import java.io.*;
import java.util.*;

// DigitalCertificate class implementing Serializable
class DigitalCertificate implements Serializable {
    private static final long serialVersionUID = 1L;

    private String holderName;
    private String certificateID;
    private String expiryDate;

    public DigitalCertificate(String holderName, String certificateID, String expiryDate) {
        this.holderName = holderName;
        this.certificateID = certificateID;
        this.expiryDate = expiryDate;
    }

    public String getHolderName() {
        return holderName;
    }

    public String getCertificateID() {
        return certificateID;
    }

    public String getExpiryDate() {
        return expiryDate;
    }

    public void displayCertificate() {
        System.out.println("Holder Name   : " + holderName);
        System.out.println("Certificate ID: " + certificateID);
        System.out.println("Expiry Date   : " + expiryDate);
    }
}

public class DigitalCertificateManager {
    private static final String FILE_NAME = "certificates.dat";

    // Method to save a certificate by updating the list
    public static void saveCertificate(DigitalCertificate cert) {
        List<DigitalCertificate> certList = new ArrayList<>();

        // If file exists, load existing certificates first
        File file = new File(FILE_NAME);
        if (file.exists()) {
            try (ObjectInputStream ois = new ObjectInputStream(new FileInputStream(file))) {
                certList = (List<DigitalCertificate>) ois.readObject();
            } catch (IOException | ClassNotFoundException e) {
                certList = new ArrayList<>();
            }
        }

        // Add new cert and write back entire list
        certList.add(cert);
        try (ObjectOutputStream oos = new ObjectOutputStream(new FileOutputStream(FILE_NAME)))
{
            oos.writeObject(certList);
            System.out.println("\nCertificate saved successfully!\n");
        } catch (IOException e) {
            System.out.println("Error saving certificate.");
            e.printStackTrace();
        }
    }

    // Method to load and display all certificates
    public static void loadCertificates() {
        File file = new File(FILE_NAME);
        if (!file.exists()) {
            System.out.println("\nNo certificates found. Please issue some certificates first.\n");
            return;
        }

        try (ObjectInputStream ois = new ObjectInputStream(new FileInputStream(file))) {
            List<DigitalCertificate> certList = (List<DigitalCertificate>) ois.readObject();
            if (certList.isEmpty()) {
                System.out.println("\nNo certificates available.\n");
                return;
            }

            int count = 0;
            for (DigitalCertificate cert : certList) {
                System.out.println("\n----- Certificate " + (++count) + " -----");
                cert.displayCertificate();
                System.out.println("------------------------------");
            }
            System.out.println("\nAll certificates loaded successfully.\n");
        } catch (IOException | ClassNotFoundException e) {
            System.out.println("Error loading certificates.");
            e.printStackTrace();
        }
    }
```

```java
    // Main menu
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        int choice;

        do {
            System.out.println("========================================");
            System.out.println("     Digital Certificate System     ");
            System.out.println("========================================");
            System.out.println("1. Issue New Certificate");
            System.out.println("2. View All Certificates");
            System.out.println("3. Exit");
            System.out.print("Choose an option: ");
            while (!scanner.hasNextInt()) {
                System.out.print("Please enter a valid number (1-3): ");
                scanner.next();
            }
            choice = scanner.nextInt();
            scanner.nextLine(); // consume newline

            switch (choice) {
                case 1:
                    System.out.print("Enter Holder Name: ");
                    String name = scanner.nextLine();
                    System.out.print("Enter Certificate ID: ");
                    String id = scanner.nextLine();
                    System.out.print("Enter Expiry Date (YYYY-MM-DD): ");
                    String expiry = scanner.nextLine();
                    DigitalCertificate cert = new DigitalCertificate(name, id, expiry);
                    saveCertificate(cert);
                    break;

                case 2:
                    loadCertificates();
                    break;

                case 3:
                    System.out.println("\nExiting system. Goodbye!\n");
                    break;

                default:
                    System.out.println("Invalid choice. Please try again.\n");
            }
        } while (choice != 3);

        scanner.close();
    }
}
```

**Output :**



```
========================================
      Digital Certificate System
========================================
1. Issue New Certificate
2. View All Certificates
3. Exit
Choose an option: 1
Enter Holder Name: Rahul
Enter Certificate ID: FEWD12748
Enter Expiry Date (YYYY-MM-DD): 2026-10-12

Certificate saved successfully!


========================================
      Digital Certificate System
========================================
1. Issue New Certificate
2. View All Certificates
3. Exit
Choose an option: 1
Enter Holder Name: Raj
Enter Certificate ID: DS129547
Enter Expiry Date (YYYY-MM-DD): 2027-12-19

Certificate saved successfully!
```



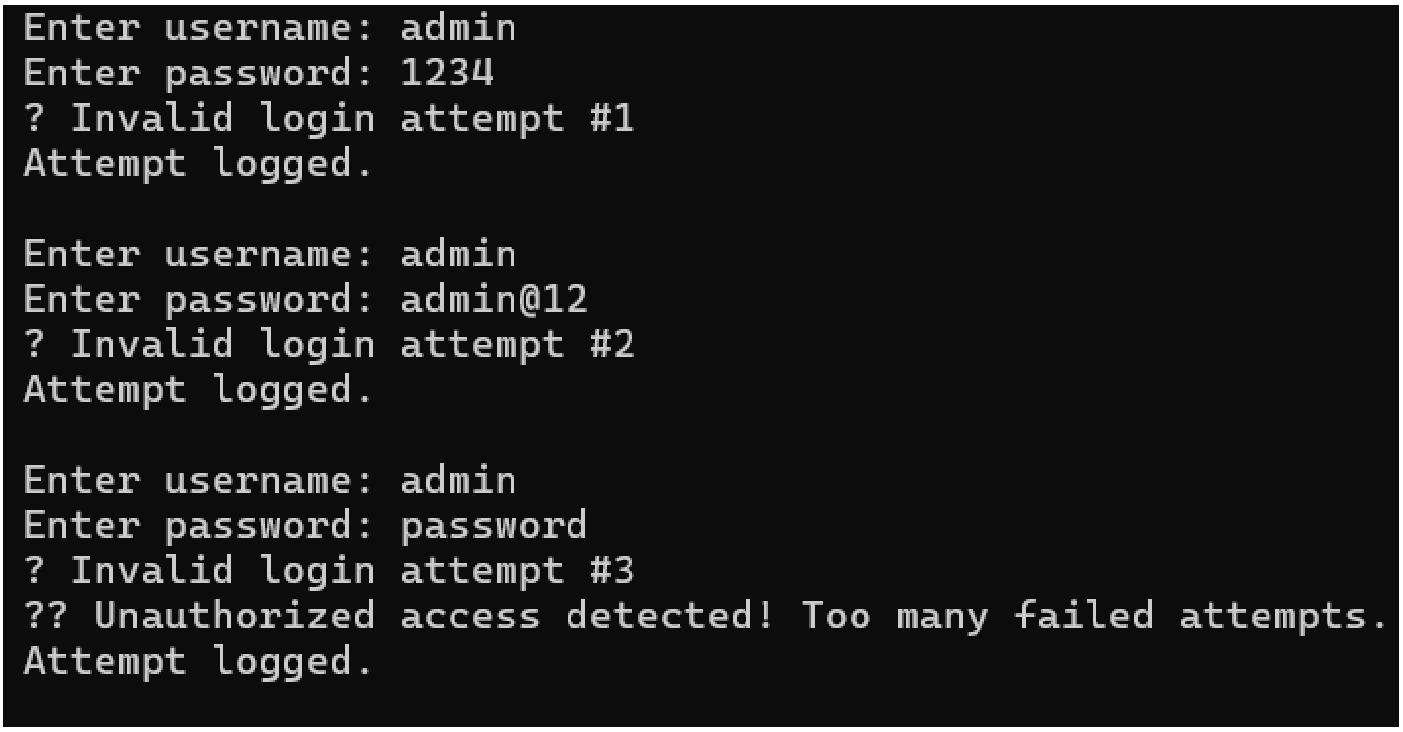
```
========================================
      Digital Certificate System
========================================
1. Issue New Certificate
2. View All Certificates
3. Exit
Choose an option: 2

----- Certificate 1 -----
Holder Name    : 11
Certificate ID: 111
Expiry Date    : 2023-10-11
------------------------------

----- Certificate 2 -----
Holder Name    : Rahul
Certificate ID: FEWD12748
Expiry Date    : 2026-10-12
------------------------------

----- Certificate 3 -----
Holder Name    : Raj
Certificate ID: DS129547
Expiry Date    : 2027-12-19
------------------------------

All certificates loaded successfully.

========================================
      Digital Certificate System
========================================
1. Issue New Certificate
2. View All Certificates
3. Exit
Choose an option: 3

Exiting system. Goodbye!
```

## 11.a) Cybersecurity Intrusion Detection System

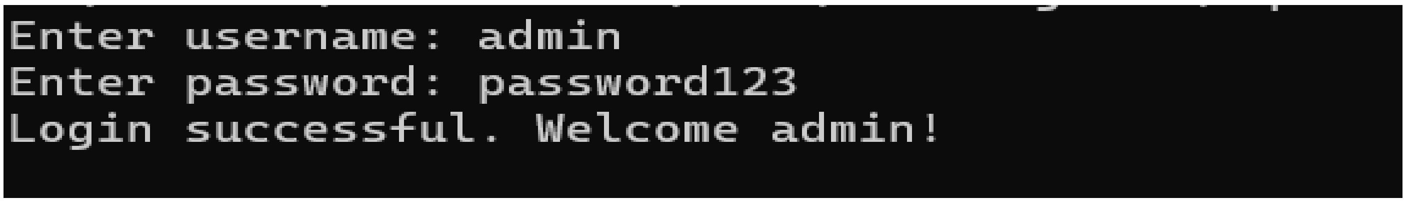
**Code :**

```
import java.util.Scanner;
// Custom Exception Class
class UnauthorizedAccessException extends Exception {
    public UnauthorizedAccessException(String message) {
        super(message);
    }
}
// Intrusion Detection System Class
class IntrusionDetection {
    private int invalidAttempts = 0;
    private final int threshold = 3;

    // Method to validate login
    public void validateLogin(String username, String password) throws
UnauthorizedAccessException {
        // Simulated correct credentials
        String correctUsername = "admin";
        String correctPassword = "password123";

        if (username.equals(correctUsername) && password.equals(correctPassword)) {
            System.out.println("Login successful. Welcome " + username + "!");
            invalidAttempts = 0; // reset counter on success
            System.exit(0);
        } else {
            invalidAttempts++;
            System.out.println("Invalid login attempt #" + invalidAttempts);

            // Check if invalid attempts exceed threshold
            if (invalidAttempts >= threshold) {
                throw new UnauthorizedAccessException("Unauthorized access detected! Too many failed
attempts.");
            }
        }
    }
}
// Main Class to run the program
public class CyberSecuritySystem {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        IntrusionDetection ids = new IntrusionDetection();
        // Allow continuous login attempts
        while (true) {
            try {
                System.out.print("Enter username: ");
                String username = scanner.nextLine();
                System.out.print("Enter password: ");
                String password = scanner.nextLine();

                // Validate the login attempt
                ids.validateLogin(username, password);
              } catch (UnauthorizedAccessException e) {
                System.out.println(e.getMessage());
                break; // Exit after breach detection
              } finally {
                System.out.println("Attempt logged.\n");
              }
            }
            scanner.close();
          }
        }
```

**Output :**



```
Enter username: admin
Enter password: 1234
? Invalid login attempt #1
Attempt logged.

Enter username: admin
Enter password: admin@12
? Invalid login attempt #2
Attempt logged.

Enter username: admin
Enter password: password
? Invalid login attempt #3
?? Unauthorized access detected! Too many failed attempts.
Attempt logged.
```



```
Enter username: admin
Enter password: password123
Login successful. Welcome admin!
```

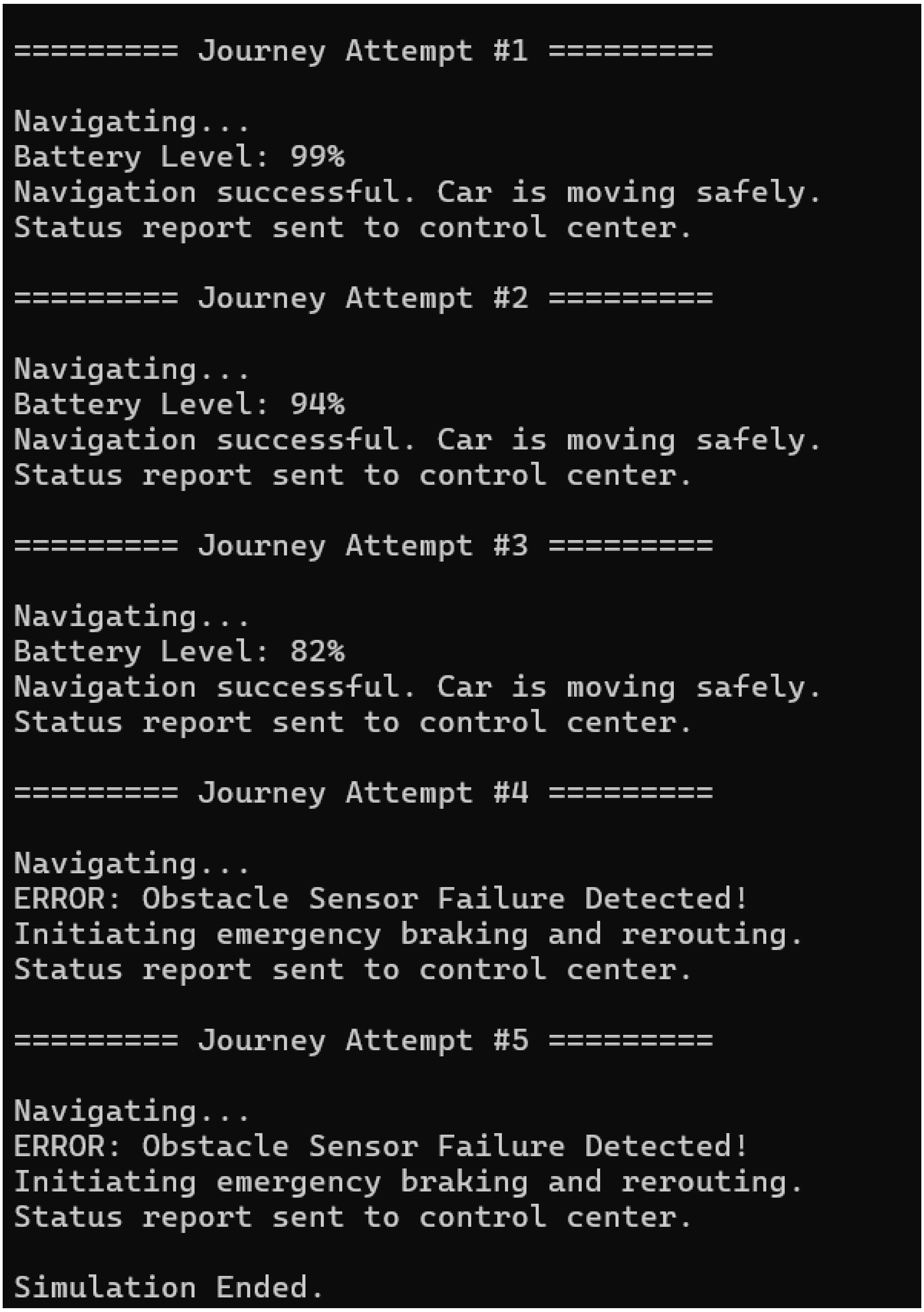
## 11.b) Autonomous Vehicle Error Handling System

**Code :**

```
import java.util.Random;
// Base Exception for all car-related issues
class CarException extends Exception {
   public CarException(String message) {
      super(message);
   }
}

// Specific Exceptions
class SensorFailureException extends CarException {
   public SensorFailureException(String message) {
      super(message);
   }
}

class GPSFailureException extends CarException {
   public GPSFailureException(String message) {
      super(message);
   }
}

class LowBatteryException extends CarException {
   public LowBatteryException(String message) {
      super(message);
   }
}

// AutonomousCar class with multiple safety checks
class AutonomousCar {
   private Random random = new Random();
   private int batteryLevel = 100;

   public void navigate() throws SensorFailureException, GPSFailureException, LowBatteryException
{
      System.out.println("\nNavigating...");

      checkSensors();
      checkGPS();
      checkBattery();

      System.out.println("Navigation successful. Car is moving safely.");
   }

   private void checkSensors() throws SensorFailureException {
      if (random.nextInt(100) < 20) { // 20% chance of failure
         throw new SensorFailureException("Obstacle Sensor Failure Detected!");
```

```
        }
    }

    private void checkGPS() throws GPSFailureException {
        if (random.nextInt(100) < 10) { // 10% chance of failure
            throw new GPSFailureException("GPS Signal Lost!");
        }
    }

    private void checkBattery() throws LowBatteryException {
        batteryLevel -= random.nextInt(15); // Simulate battery drain
        if (batteryLevel < 20) {
            throw new LowBatteryException("Low Battery: " + batteryLevel + "% remaining.");
        }
        System.out.println("Battery Level: " + batteryLevel + "%");
    }
}

// Main simulation class
public class AutonomousCarSystem {

    public static void main(String[] args) {
        AutonomousCar car = new AutonomousCar();

        // Simulating continuous navigation attempts
        for (int i = 1; i <= 5; i++) {
            System.out.println("\n========= Journey Attempt #" + i + " =========");

            try {
                car.navigate();
            } catch (SensorFailureException e) {
                System.out.println("ERROR: " + e.getMessage());
                System.out.println("Initiating emergency braking and rerouting.");
            } catch (GPSFailureException e) {
                System.out.println("ERROR: " + e.getMessage());
                System.out.println("Switching to offline navigation mode.");
            } catch (LowBatteryException e) {
                System.out.println("ERROR: " + e.getMessage());
                System.out.println("Redirecting to nearest charging station.");
                break; // Stop further attempts on low battery
            } finally {
                System.out.println("Status report sent to control center.");
            }
        }

        System.out.println("\nSimulation Ended.");
    }
}
```

**Output :**



```
========= Journey Attempt #1 =========

Navigating...
Battery Level: 99%
Navigation successful. Car is moving safely.
Status report sent to control center.

========= Journey Attempt #2 =========

Navigating...
Battery Level: 94%
Navigation successful. Car is moving safely.
Status report sent to control center.

========= Journey Attempt #3 =========

Navigating...
Battery Level: 82%
Navigation successful. Car is moving safely.
Status report sent to control center.

========= Journey Attempt #4 =========

Navigating...
ERROR: Obstacle Sensor Failure Detected!
Initiating emergency braking and rerouting.
Status report sent to control center.

========= Journey Attempt #5 =========

Navigating...
ERROR: Obstacle Sensor Failure Detected!
Initiating emergency braking and rerouting.
Status report sent to control center.

Simulation Ended.
```