**Domain 7: Vehicle Rental System – Domain Description & Initial Modeling**

**1. Domain Description**

The Vehicle Rental System allows users to rent a variety of vehicles (cars, vans, trucks, electric scooters) for short or long durations. The platform supports real-time availability, online booking, identity verification, and vehicle tracking using GPS. Users can manage rental contracts, view rental history, and access loyalty rewards. The system also supports vehicle maintenance tracking, pricing management, and customer support for multiple locations.

Features:

* Browse and search for vehicles by type, availability, and location
* Real-time vehicle availability and GPS tracking
* Booking and rental contract management
* Customer identity verification
* Maintenance tracking and reporting
* Multi-location support for vehicle fleets
* Secure payment processing with multi-method support
* Loyalty and reward program for frequent users

**2. Initial Object Identification Table**

| **Object Name** | **Description** |
| --- | --- |
| Customer | Represents an individual who rents vehicles |
| Vehicle | A rental unit (car, truck, scooter, etc.) |
| VehicleCategory | Classification of vehicle types (e.g., electric, SUV) |
| Booking | Represents the reservation details of a rental |
| RentalContract | Legal agreement for a vehicle rental |
| Location | Pickup or drop-off point for vehicles |
| Payment | Tracks payment for a rental |
| MaintenanceRecord | Details of repairs and service for a vehicle |
| GPSData | Real-time tracking data for vehicles |
| LoyaltyProgram | Stores rewards and status for frequent customers |
| DamageReport | Records issues found on vehicle return |

**3. Initial Attribute and Method Tables**

* **Customer**

***Attributes:***

| Attribute | Type | Visibility | Rationale |
| --- | --- | --- | --- |
| customerID | int | private | Unique customer identifier |
| name | String | private | Customer name |
| email | String | private | Contact info |
| phone | String | private | Communication |
| licenseNumber | String | private | Driver's license ID |
| loyaltyProgram | LoyaltyProgram | private | Reward system |

***Methods:***

| Method | Return Type | Visibility | Rationale |
| --- | --- | --- | --- |
| register() | void | public | New customer account |
| bookVehicle() | Booking | public | Reserve a vehicle |
| viewRentalHistory() | List<Booking> | public | View past rentals |

* **Vehicle**

***Attributes:***

| Attribute | Type | Visibility | Rationale |
| --- | --- | --- | --- |
| vehicleID | int | private | Unique ID |
| make | String | private | Manufacturer |
| model | String | private | Vehicle model |
| year | int | private | Manufacture year |
| licensePlate | String | private | Vehicle ID |
| status | String | private | Available, Rented, Maintenance |
| category | VehicleCategory | private | SUV, sedan, scooter, etc. |
| currentLocation | Location | private | Where vehicle is now |

***Methods:***

| Method | Return Type | Visibility | Rationale |
| --- | --- | --- | --- |
| checkAvailability() | boolean | public | Check if available |
| updateStatus() | void | public | Set to rented/available |

* **Booking**

***Attributes:***

| Attribute | Type | Visibility | Rationale |
| --- | --- | --- | --- |
| bookingID | int | private | Unique ID |
| customer | Customer | private | Who made the booking |
| vehicle | Vehicle | private | Vehicle reserved |
| startDate | DateTime | private | Rental start |
| endDate | DateTime | private | Rental end |
| pickupLocation | Location | private | Start of rental |
| dropoffLocation | Location | private | End of rental |
| status | String | private | Active, Cancelled, Completed |

***Methods:***

| Method | Return Type | Visibility | Rationale |
| --- | --- | --- | --- |
| cancel() | void | public | Cancel booking |
| modifyBooking() | void | public | Update details |

* **RentalContract**

Attributes:

| Attribute | Type | Visibility | Rationale |
| --- | --- | --- | --- |
| contractID | int | private | Unique ID |
| booking | Booking | private | Associated booking |
| terms | String | private | Agreement text |
| signedDate | Date | private | When signed |

* **Payment**

***Attributes:***

| Attribute | Type | Visibility | Rationale |
| --- | --- | --- | --- |
| paymentID | int | private | Unique payment reference |
| amount | double | private | Charged amount |
| method | String | private | Credit, debit, PayPal |
| status | String | private | Paid, Pending, Refunded |

***Methods:***

| Method | Return Type | Visibility | Rationale |
| --- | --- | --- | --- |
| process() | boolean | public | Confirm payment |
| refund() | boolean | public | Refund if applicable |

* **VehicleCategory**

| Attribute | Type | Visibility | Rationale |
| --- | --- | --- | --- |
| categoryID | int | private | Unique identifier |
| name | String | private | e.g., SUV, electric, economy |

**4. Initial UML Class Diagram**

