Case Study – Car Connect System

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Key Functionalities:

User Authentication:

- Secure user authentication and authorization mechanisms.

Vehicle Management:

- CRUD operations for vehicles, including details such as model, make, availability, and pricing.

Reservation System:

- Real-time reservation handling with conflict resolution.
- Email/SMS notifications for reservation confirmation and reminders.

Reporting:

- Generation of reports for administrators, including reservation history, vehicle utilization, and revenue.

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SQL Tables:

1. Customer Table
2. Vehicle Table
3. Reservation Table
4. Admin Table

```sql
-- Customer Table
CREATE TABLE Customer (
    -- Auto-incrementing unique ID for each customer
    FirstName NVARCHAR(50) NOT NULL,
    LastName NVARCHAR(50) NOT NULL,
    Email NVARCHAR(100) NOT NULL UNIQUE,
    PhoneNumber NVARCHAR(15) NOT NULL,
    Address NVARCHAR(255) NOT NULL,
    Username NVARCHAR(50) NOT NULL UNIQUE,  -- Unique username for login
    Password NVARCHAR(255) NOT NULL,  -- Securely hashed password
    RegistrationDate DATETIME NOT NULL DEFAULT GETDATE()  -- Default to the current date and time
);
```

100 %

Results | **Messages**

FirstName	LastName	Email	PhoneNumber	Address	Username	Password	RegistrationDate	CustomerID

```sql
-- Vehicle Table
CREATE TABLE Vehicle (
    VehicleID INT PRIMARY KEY IDENTITY(1,1),  -- Auto-incrementing unique ID for each vehicle
    Model NVARCHAR(50) NOT NULL,
    Make NVARCHAR(50) NOT NULL,
    Year INT NOT NULL,
    Color NVARCHAR(20),
    RegistrationNumber NVARCHAR(20) NOT NULL UNIQUE,  -- Unique registration number
    Availability BIT NOT NULL DEFAULT 1,  -- 1 = Available, 0 = Not Available
    DailyRate DECIMAL(10, 2) NOT NULL  -- Daily rental rate with two decimal places
);

select * from Vehicle;
```

100 %

Results | **Messages**

VehicleID	Model	Make	Year	Color	RegistrationNumber	Availability	DailyRate

```sql
-- Reservation Table
CREATE TABLE Reservation (
    ReservationID INT PRIMARY KEY IDENTITY(1,1),  -- Auto-incrementing unique ID for each reservation
    CustomerID INT NOT NULL,
    VehicleID INT NOT NULL,
    StartDate DATETIME NOT NULL,
    EndDate DATETIME NOT NULL,
    TotalCost DECIMAL(10, 2) NOT NULL,  -- Total cost with two decimal places
    Status NVARCHAR(20) NOT NULL,  -- e.g., pending, confirmed, completed
    CONSTRAINT FK_Reservation_Customer FOREIGN KEY (CustomerID) REFERENCES Customer(CustomerID),
    CONSTRAINT FK_Reservation_Vehicle FOREIGN KEY (VehicleID) REFERENCES Vehicle(VehicleID)
);

select * from Reservation;
```

100 %

Results | **Messages**

ReservationID	CustomerID	VehicleID	StartDate	EndDate	TotalCost	Status

```sql
-- Admin Table
CREATE TABLE Admin (
    AdminID INT PRIMARY KEY IDENTITY(1,1),  -- Auto-incrementing unique ID for each admin
    FirstName NVARCHAR(50) NOT NULL,
    LastName NVARCHAR(50) NOT NULL,
    Email NVARCHAR(100) NOT NULL UNIQUE,
    PhoneNumber NVARCHAR(15) NOT NULL,
    Username NVARCHAR(50) NOT NULL UNIQUE,  -- Unique username for login
    Password NVARCHAR(255) NOT NULL,  -- Securely hashed password
    Role NVARCHAR(50) NOT NULL,  -- Role within the system (e.g., super admin, fleet manager)
    JoinDate DATETIME NOT NULL DEFAULT GETDATE()  -- Default to the current date and time
);

select * from Admin;
```
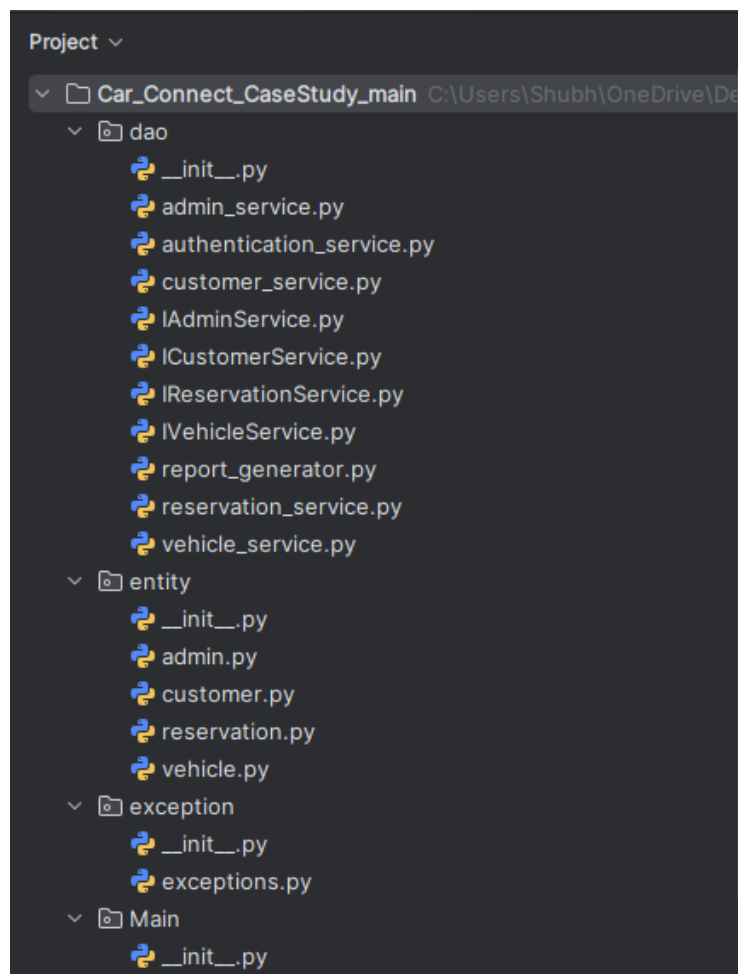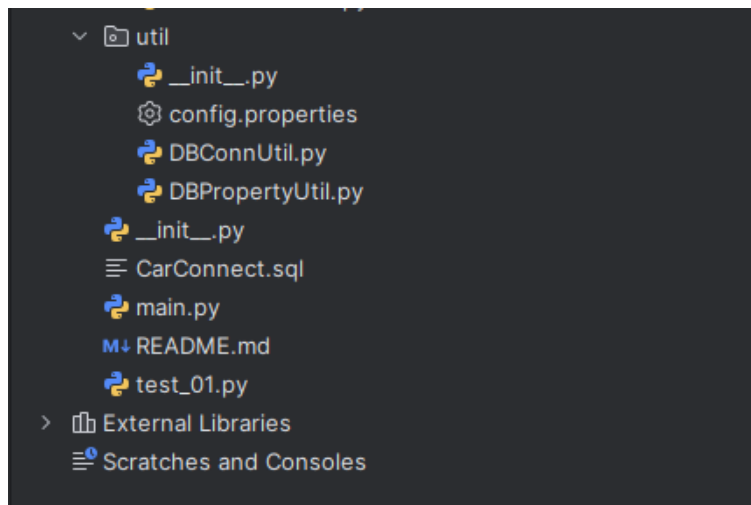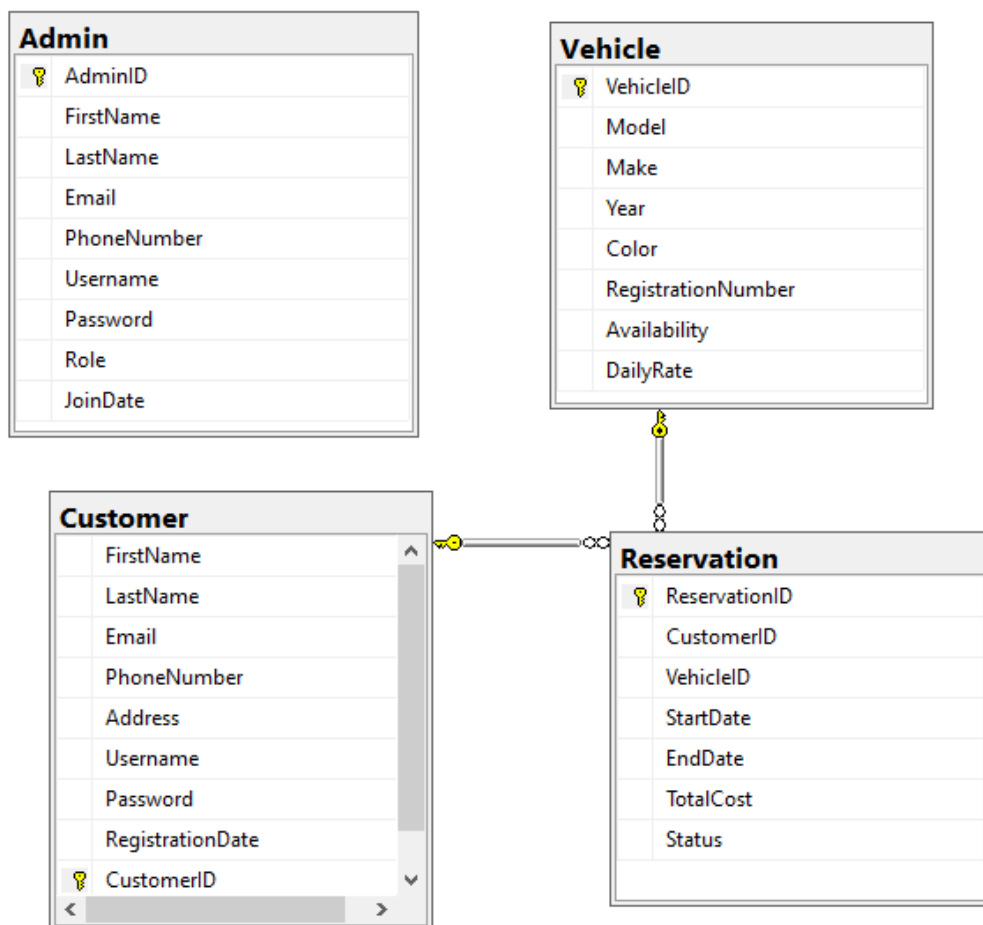
100 %

Results | Messages

AdminID	FirstName	LastName	Email	PhoneNumber	Username	Password	Role	JoinDate

Project Structure:

E-R Diagram-
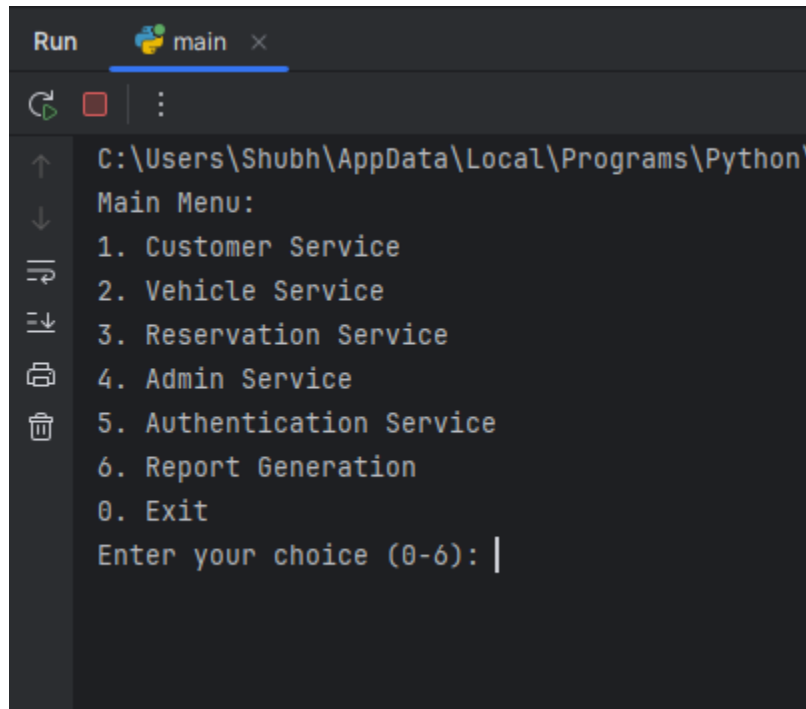
Implementation Of Car Connect System-

```
Run    🐍 main  ×

C: ⟳  ⬜  ⋮

  ↑    C:\Users\Shubh\AppData\Local\Programs\Python\
  ↓    Main Menu:
  ⇥    1. Customer Service
       2. Vehicle Service
  ⇲    3. Reservation Service
  🖨    4. Admin Service
  🗑    5. Authentication Service
       6. Report Generation
       0. Exit
       Enter your choice (0-6): |
```

1. Customer Service Section-

Registering a new customer in database-

```
Enter your choice (0-6): 1
Customer Service:
1. Get Customer by ID
2. Get Customer by Username
3. Register a new Customer
4. Update Customer information
5. Delete a Customer
0. Exit
Enter your choice (0-5): 3
Enter first name: Subrat
Enter last name: Shukla
Enter email: subrat@email.com
Enter phone number: 9928211389
Enter address: Jaipur
Enter username: shubh17
Enter password: 12345678
Enter registration date (YYYY-MM-DD): 2024-10-13
Customer registered successfully.
```

```
select * from Customer;
```

100 %

⊞ Results ⧉ Messages

	FirstName	LastName	Email	PhoneNumber	Address	Username	Password	RegistrationDate	CustomerID
1	Subrat	Shukla	subrat@email.com	9928211389	Jaipur	shubh17	12345678	2024-10-13 00:00:00.000	1

Getting Customer Details by ID-

```
Customer Service:
1. Get Customer by ID
2. Get Customer by Username
3. Register a new Customer
4. Update Customer information
5. Delete a Customer
0. Exit
Enter your choice (0-5): 1
Enter customer ID to get: 1

Customer Data: ('Subrat', 'Shukla', 'subrat@email.com', '9928211389', 'Jaipur', 'shubh17', '12345678', datetime.datetime(2024, 10, 13, 0, 0), 1)
```

Getting Customer Details by Username-

```
Customer Service:
1. Get Customer by ID
2. Get Customer by Username
3. Register a new Customer
4. Update Customer information
5. Delete a Customer
0. Exit
Enter your choice (0-5): 2
Enter username to get customer data: shubh17

Customer Data: {'CustomerID': 1, 'Password': '12345678'}
```

Updating Customer Details-

```
Customer Service:
1. Get Customer by ID
2. Get Customer by Username
3. Register a new Customer
4. Update Customer information
5. Delete a Customer
0. Exit
Enter your choice (0-5): 4
Enter customer ID to update: 1
Enter updated first name: Aniroop
Enter updated last name: Gupta
Enter updated email: aniroop@email.com
Enter updated phone number: 9876543210
Enter updated address: Kanpur
Enter updated username: aniroop10
Enter updated password: 87654321
Enter updated registration date (YYYY-MM-DD): 2024-10-14
Customer updated successfully.
```

```
select * from Customer;
```

	FirstName	LastName	Email	PhoneNumber	Address	Username	Password	RegistrationDate	CustomerID
1	Aniroop	Gupta	aniroop@email.com	9876543210	Kanpur	aniroop10	87654321	2024-10-14 00:00:00.000	1

Deleting a customer from database-

```
Customer Service:
1. Get Customer by ID
2. Get Customer by Username
3. Register a new Customer
4. Update Customer information
5. Delete a Customer
0. Exit
Enter your choice (0-5): 5
Enter customer ID to delete: 1
Customer with ID 1 deleted successfully.
```

```
select * from Customer;
```

FirstName	LastName	Email	PhoneNumber	Address	Username	Password	RegistrationDate	CustomerID

Exiting from Customer Service Section and returning to main menu-

```
Customer Service:
1. Get Customer by ID
2. Get Customer by Username
3. Register a new Customer
4. Update Customer information
5. Delete a Customer
0. Exit
Enter your choice (0-5): 0
Main Menu:
1. Customer Service
2. Vehicle Service
3. Reservation Service
4. Admin Service
5. Authentication Service
6. Report Generation
0. Exit
```

2. <u>Vehicle Service Section-</u>

Adding new vehicle in the database-

```
Enter your choice (0-6): 2
Vehicle Service:
1. Get Vehicle by ID
2. Get Available Vehicles
3. Add Vehicle
4. Update Vehicle
5. Remove Vehicle
0. Exit
Enter your choice (0-5): 3
Enter model: 3XO
Enter make: Jaipur
Enter year: 2024
Enter color: Red
Enter registration number: 8732
Enter daily rate: 800000
Vehicle added successfully.
```

```
select * from Vehicle;
```

100 %

Results   Messages

	VehicleID	Model	Make	Year	Color	RegistrationNumber	Availability	DailyRate
1	1	3XO	Jaipur	2024	Red	8732	1	800000.00

Getting vehicle by Id-

```
Vehicle Service:
1. Get Vehicle by ID
2. Get Available Vehicles
3. Add Vehicle
4. Update Vehicle
5. Remove Vehicle
0. Exit
Enter your choice (0-5): 1
Enter vehicle ID to get: 1

Vehicle Data: (1, '3XO', 'Jaipur', 2024, 'Red', '8732', True, Decimal('800000.00'))
```

Getting available vehicle details-

```
Vehicle Service:
1. Get Vehicle by ID
2. Get Available Vehicles
3. Add Vehicle
4. Update Vehicle
5. Remove Vehicle
0. Exit
Enter your choice (0-5): 2

Available Vehicles:
(1, '3X0', 'Jaipur', 2024, 'Red', '8732', True, Decimal('800000.00'))
```

Updating vehicle information-

```
Vehicle Service:
1. Get Vehicle by ID
2. Get Available Vehicles
3. Add Vehicle
4. Update Vehicle
5. Remove Vehicle
0. Exit
Enter your choice (0-5): 4
Enter vehicle ID to update: 1
Enter updated model: BMW
Enter updated make: Delhi
Enter updated year: 2025
Enter updated color: White
Enter updated registration number: 9928
Enter updated daily rate: 6000000
Vehicle updated successfully.
```
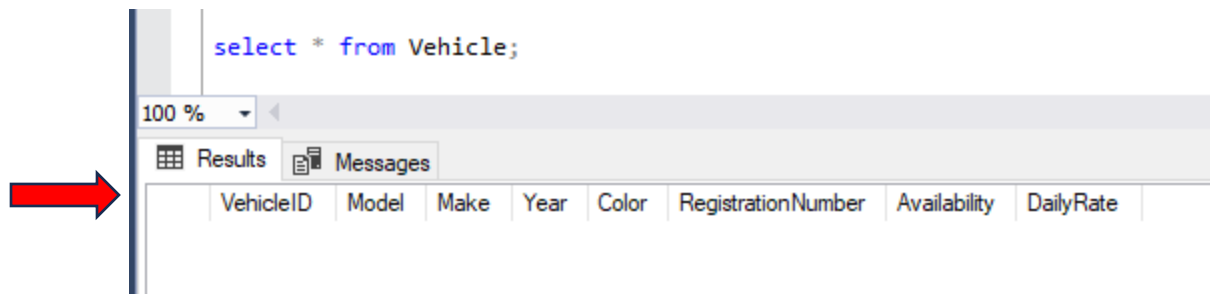
Removing vehicle-

```
Vehicle Service:
1. Get Vehicle by ID
2. Get Available Vehicles
3. Add Vehicle
4. Update Vehicle
5. Remove Vehicle
0. Exit
Enter your choice (0-5): 5
Enter vehicle ID to delete: 1
Vehicle removed successfully.
```

```
select * from Vehicle;
```

100 %

Results Messages

VehicleID	Model	Make	Year	Color	RegistrationNumber	Availability	DailyRate

Exiting from Customer Service Section and returning to main menu-

```
Vehicle Service:
1. Get Vehicle by ID
2. Get Available Vehicles
3. Add Vehicle
4. Update Vehicle
5. Remove Vehicle
0. Exit
Enter your choice (0-5): 0
Main Menu:
1. Customer Service
2. Vehicle Service
3. Reservation Service
4. Admin Service
5. Authentication Service
6. Report Generation
0. Exit
Enter your choice (0-6):
```

3. Reservation Service Section-

Creating a new reservation-

```
Enter your choice (0-6): 3
Reservation Service:
1. Get Reservation by ID
2. Get Reservation by CustomerId
3. Create Reservation
4. Update Reservation
5. Cancel Reservation
0. Exit
Enter your choice (0-5): 3
Enter customer ID: 2
Enter vehicle ID: 2
Enter reservation duration (in days): 100
Enter total cost: 10000
Enter reservation status: Confirmed
Reservation created successfully.
```

```
select * from Reservation;
```

100 %

▦ Results ▣ Messages

	ReservationID	CustomerID	VehicleID	StartDate	EndDate	TotalCost	Status
1	1	2	2	2024-10-13 14:56:53.233	2025-01-21 14:56:53.233	10000.00	Confirmed

Getting reservation by reservation ID-

```
Reservation Service:
1. Get Reservation by ID
2. Get Reservation by CustomerId
3. Create Reservation
4. Update Reservation
5. Cancel Reservation
0. Exit
Enter your choice (0-5): 1
Enter reservation ID to get: 1

Reservation Data: (1, 2, 2, datetime.datetime(2024, 10, 13, 14, 56, 53, 233000),
```

```
datetime.datetime(2025, 1, 21, 14, 56, 53, 233000), Decimal('10000.00'), 'Confirmed')
```

Getting reservations details by customer ID-

```
Reservation Service:
1. Get Reservation by ID
2. Get Reservation by CustomerId
3. Create Reservation
4. Update Reservation
5. Cancel Reservation
0. Exit
Enter your choice (0-5): 2
Enter customer ID to get reservations: 2

Reservations Data:
(1, 2, 2, datetime.datetime(2024, 10, 13, 14, 56, 53, 233000), datetime.datetime(2025, 1, 21, 14, 56, 53, 233000), Decimal('10000.00'), 'Confirmed')
```

Updating reservation details-

```
Reservation Service:
1. Get Reservation by ID
2. Get Reservation by CustomerId
3. Create Reservation
4. Update Reservation
5. Cancel Reservation
0. Exit
Enter your choice (0-5): 4
Enter reservation ID update: 1
Enter customer ID: 2
Enter vehicle ID: 2
Enter updated reservation duration (in days): 50
Enter updated total cost: 5000
Enter updated reservation status: completed
Reservation updated successfully.
```

```
select * from Reservation;
```

100 %

⊞ Results 📄 Messages

	ReservationID	CustomerID	VehicleID	StartDate	EndDate	TotalCost	Status
1	1	2	2	2024-10-13 15:06:33.770	2024-12-02 15:06:33.770	5000.00	completed

Cancelling the reservation-

```
Reservation Service:
1. Get Reservation by ID
2. Get Reservation by CustomerId
3. Create Reservation
4. Update Reservation
5. Cancel Reservation
0. Exit
Enter your choice (0-5): 5
Enter reservation ID to cancle: 1
Reservation with ID 1 has been cancelled.
```

```
select * from Reservation;
```

100 %

Results | Messages

	ReservationID	CustomerID	VehicleID	StartDate	EndDate	TotalCost	Status
1	1	2	2	2024-10-13 15:06:33.770	2024-12-02 15:06:33.770	5000.00	Cancelled

Exiting from reservation service and returning to main menu-

```
Reservation Service:
1. Get Reservation by ID
2. Get Reservation by CustomerId
3. Create Reservation
4. Update Reservation
5. Cancel Reservation
0. Exit
Enter your choice (0-5): 0
Main Menu:
1. Customer Service
2. Vehicle Service
3. Reservation Service
4. Admin Service
5. Authentication Service
6. Report Generation
0. Exit
Enter your choice (0-6):
```

4. Admin Service Section-

Registering new admin in the database-

```
Enter your choice (0-6): 4
Admin Service:
1. Get Admin by ID
2. Get Admin by Username
3. Register Admin
4. Update Admin
5. Delete Admin
0. Exit
Enter your choice (0-5): 3
Enter first name: Harish
Enter last name: ER
Enter email: harish@email.com
Enter phone number: 7654321098
Enter username: harish@23
Enter password: 4567
Enter role: Super Admin
Enter join date (YYYY-MM-DD): 2024-09-15
Admin registered successfully.
```

```
select * from Admin;
```

	AdminID	FirstName	LastName	Email	PhoneNumber	Username	Password	Role	JoinDate
1	1	Harish	ER	harish@email.com	7654321098	harish@23	4567	Super Admin	2024-09-15 00:00:00.000

Get admin details by admin Id-

```
Admin Service:
1. Get Admin by ID
2. Get Admin by Username
3. Register Admin
4. Update Admin
5. Delete Admin
0. Exit
Enter your choice (0-5): 1
Enter admin ID to get: 1

Admin Data: (1, 'Harish', 'ER', 'harish@email.com', '7654321098', 'harish@23', '4567', 'Super Admin', datetime.datetime(2024, 9, 15, 0, 0))
```
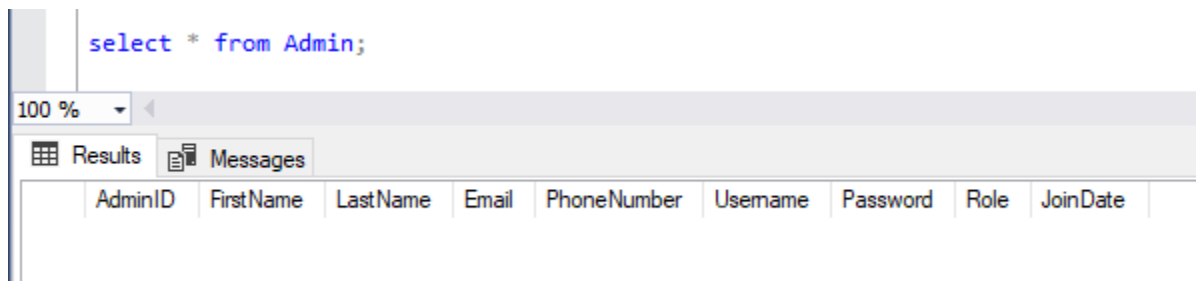
Get admin details by admin username-

```
Admin Service:
1. Get Admin by ID
2. Get Admin by Username
3. Register Admin
4. Update Admin
5. Delete Admin
0. Exit
Enter your choice (0-5): 2
Enter admin username to get: harish@23

Admin Data: {'AdminID': 1, 'Password': '4567'}
Admin Service:
```

Updating admin details-

```
Admin Service:
1. Get Admin by ID
2. Get Admin by Username
3. Register Admin
4. Update Admin
5. Delete Admin
0. Exit
Enter your choice (0-5): 4
Enter admin ID to update: 1
Enter updated first name: Rakesh
Enter updated last name: Sharma
Enter updated email: rakesh@email.com
Enter updated phone number: 4567890123
Enter updated username: rakesh@11
Enter updated password: 2341
Admin updated successfully.
```

```
select * from Admin;
```

100 %

Results | Messages

AdminID	FirstName	LastName	Email	PhoneNumber	Username	Password	Role	JoinDate
1	1	Rakesh	Sharma	rakesh@email.com	4567890123	harish@23	2341	Super Admin	2024-09-15 00:00:00.000

Deleting an admin from the database-

```
Admin Service:
1. Get Admin by ID
2. Get Admin by Username
3. Register Admin
4. Update Admin
5. Delete Admin
0. Exit
Enter your choice (0-5): 5
Enter admin ID to update: 1
Admin deleted successfully.
```

```
select * from Admin;
```

100 %

Results   Messages

AdminID	FirstName	LastName	Email	PhoneNumber	Username	Password	Role	JoinDate

Exiting from admin service and returning to main menu-

```
Admin Service:
1. Get Admin by ID
2. Get Admin by Username
3. Register Admin
4. Update Admin
5. Delete Admin
0. Exit
Enter your choice (0-5): 0
Main Menu:
1. Customer Service
2. Vehicle Service
3. Reservation Service
4. Admin Service
5. Authentication Service
6. Report Generation
0. Exit
Enter your choice (0-6): |
```

5. Authentication Service Section-

Authenticating a customer-

```
Enter your choice (0-6): 5
Authentication Service:
1. Authenticate Customer
2. Authenticate Admin
0. Exit
Enter your choice (0-2): 1
Enter customer username: rohit@17
Enter customer password: 34566
Authentication successful.
Customer authenticated: {'CustomerID': 2, 'Password': '34566'}
```

Authenticating an admin-

```
Authentication Service:
1. Authenticate Customer
2. Authenticate Admin
0. Exit
Enter your choice (0-2): 2
Enter admin username: rahul@18
Enter admin password: 9097
Authentication successful.
Admin authenticated: {'AdminID': 2, 'Password': '9097'}
```

Exiting from the authentication service and returning to the main menu-

```
Authentication Service:
1. Authenticate Customer
2. Authenticate Admin
0. Exit
Enter your choice (0-2): 0
Main Menu:
1. Customer Service
2. Vehicle Service
3. Reservation Service
4. Admin Service
5. Authentication Service
6. Report Generation
0. Exit
Enter your choice (0-6): |
```

6. <u>Report Generation Section-</u>

Generating reservation report from database-

```
Enter your choice (0-6): 6
Report Generation:
1. Generate Reservation Report
2. Generate Vehicle Report
0. Exit
Enter your choice (0-2): 1
Reservation Report:
Reservation ID | Customer ID | Vehicle ID | Start Date | End Date | Amount | Status
1              | 2           | 2          | <11 | <9 | 5000.00 | Cancelled
Reservation Report generated successfully.
```

Generating vehicle report from database-

```
Report Generation:
1. Generate Reservation Report
2. Generate Vehicle Report
0. Exit
Enter your choice (0-2): 2

Vehicle Report:
Vehicle ID | Model | Brand | Year | Color
2          | TATA  | Goa   | 2023 | Black
Vehicle Report generated successfully.
```

Exiting from report generation section and returning to main menu-

```
Report Generation:
1. Generate Reservation Report
2. Generate Vehicle Report
0. Exit
Enter your choice (0-2): 0
Main Menu:
1. Customer Service
2. Vehicle Service
3. Reservation Service
4. Admin Service
5. Authentication Service
6. Report Generation
0. Exit
Enter your choice (0-6): |
```

7. Exiting from the Car Connect System-

```
Main Menu:
1. Customer Service
2. Vehicle Service
3. Reservation Service
4. Admin Service
5. Authentication Service
6. Report Generation
0. Exit
Enter your choice (0-6): 0
Thankyou for using the Car Connect System.

Process finished with exit code 0
|
```

Hence, we have successfully completed all the functionalities of Car Connect System.