



Data Management System Design
CS631

Instructor
Prof: Eren Canan

Project Title
Rent a Car

Phase-3

Course Number - CS631

Course Section – 007

Group Number – 9

Project Title

Rent a Car

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Business Requirements

Car rental rates are determined by the class of the car has two rental rates for each class: daily and weekly. The car model, description. Each car is uniquely identified by a vehicle identification number (VIN).

The process of renting a car is as follows.

A customer first makes a reservation with his Id by telephone prior to arriving at the branch location to pick up the car. The Rent a Car service representative takes the customer's name and address and the class of a vehicle and the period of rental (date in and out) that the customer desires.

The customer is informed of the rental rate. When the customer arrives at the branch location to pick up the car, the service representative first checks for a reservation and, if a reservation exists, she draws up a rental agreement.

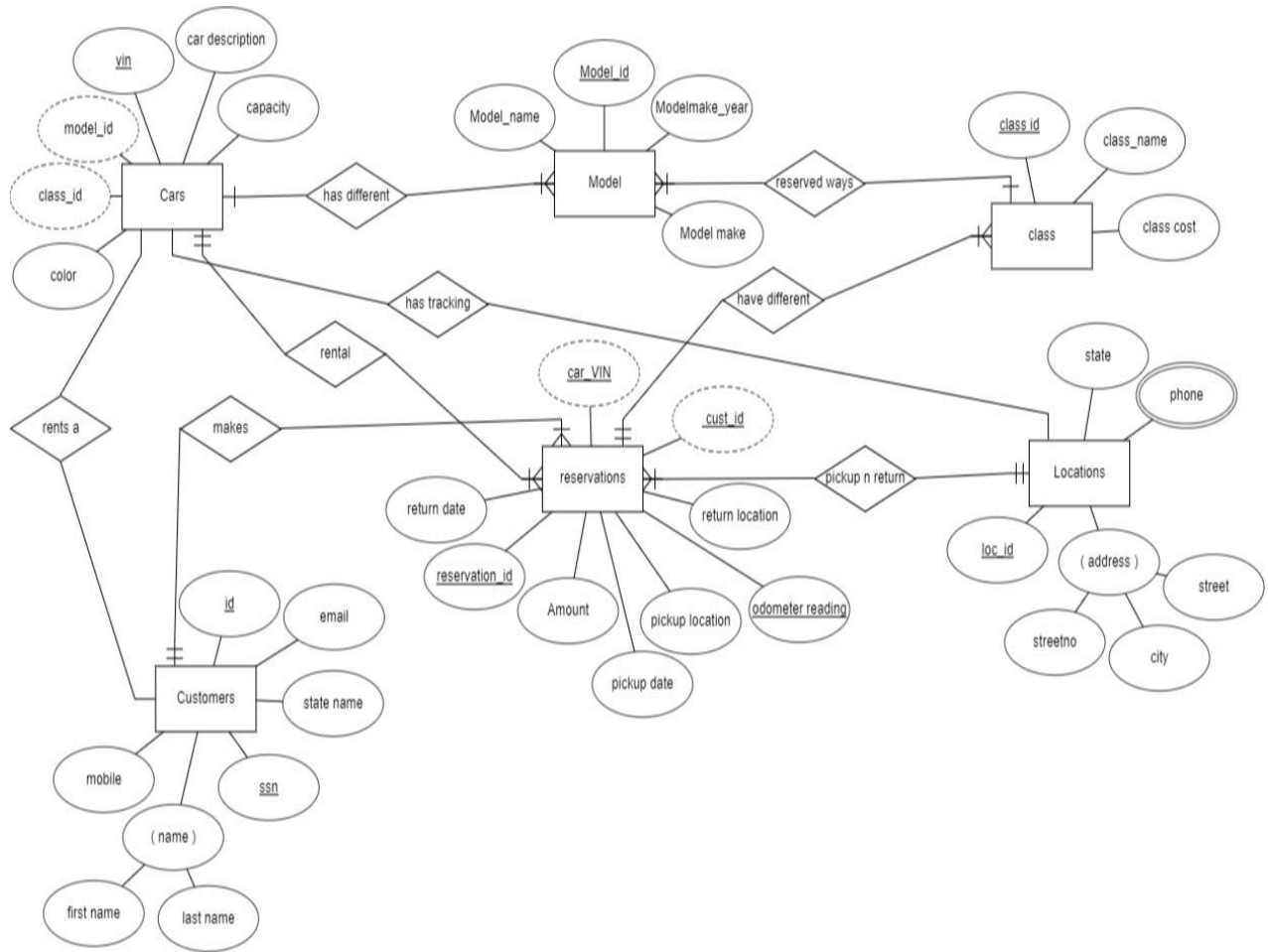
The service representative obtains other customer information, such as his operator's license number and the customer's details like SSN , mail, contact. If the customer has made a reservation, then the reservation information is used to assign a specific vehicle to the rental agreement. If the customer is a walk-in (no reservation), the service representative fills out the reservation information first as part of the process.

The rental agreement has a contract number that uniquely identifies it, the VIN number of the vehicle that is being rented, the current date and time for the rental to start . The customer is given a copy of the rental agreement along with the keys to the car. This ends the activities at the

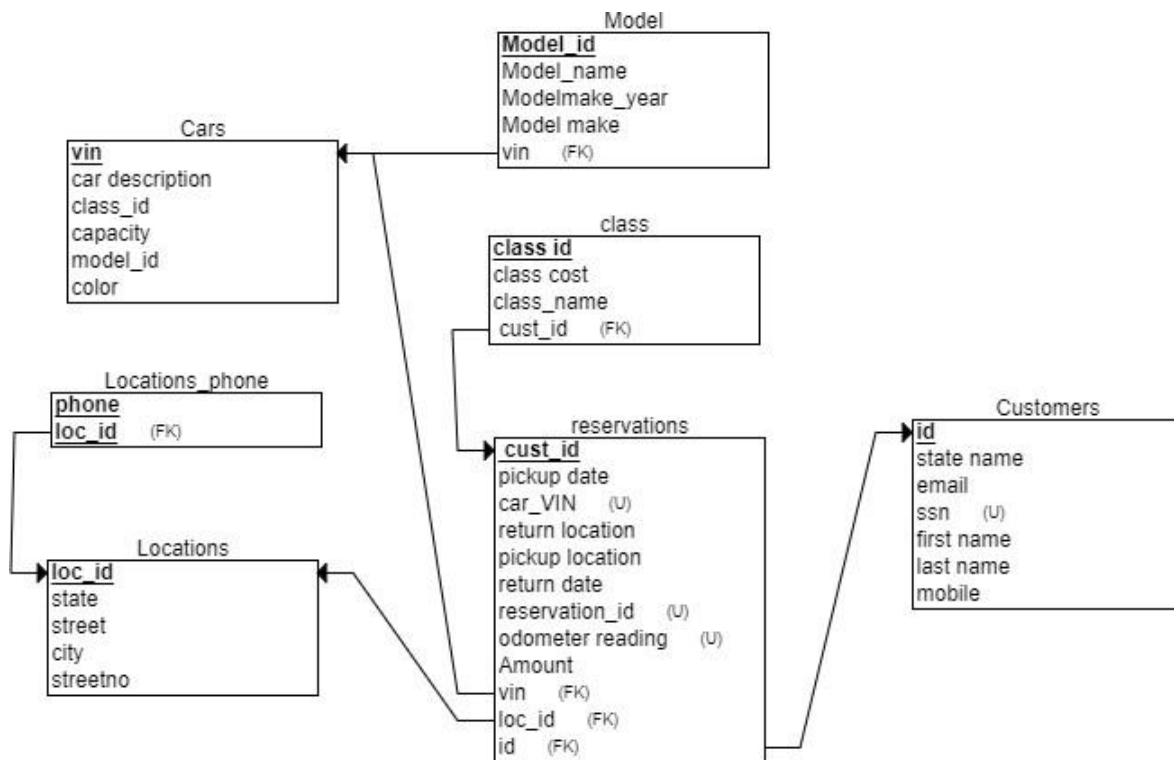
Time the vehicle is picked up.

After use, the car is returned to the branch location. Information that will be filled in when the car is returned is the date and time at which the rental ends and the odometer reading. When the rental agreement is completed, the actual cost of the rental is computed using the class rental rate, and the cost is charged to the customer's credit card . No other form of payment is accepted.

Entity-Relationship Diagram (ER):



Relational Schema :



Application Program Design:

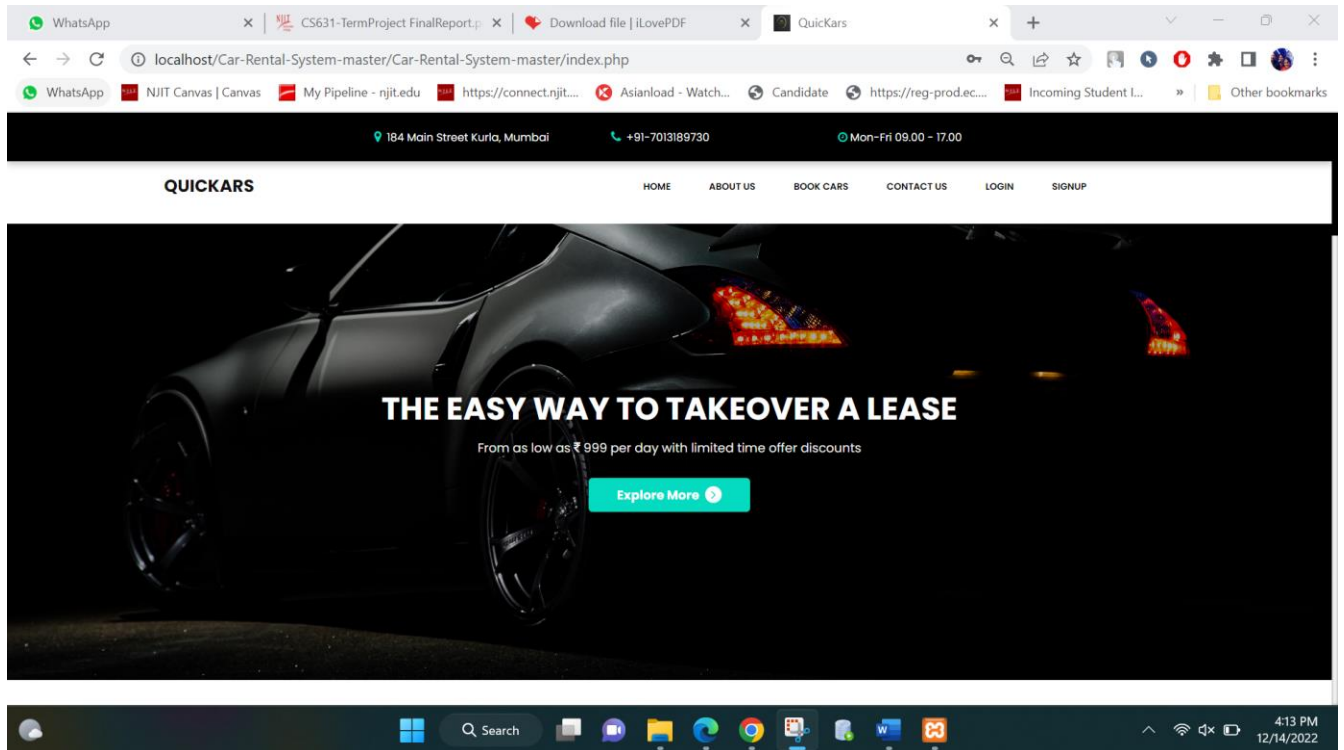


Fig.1 Main Page

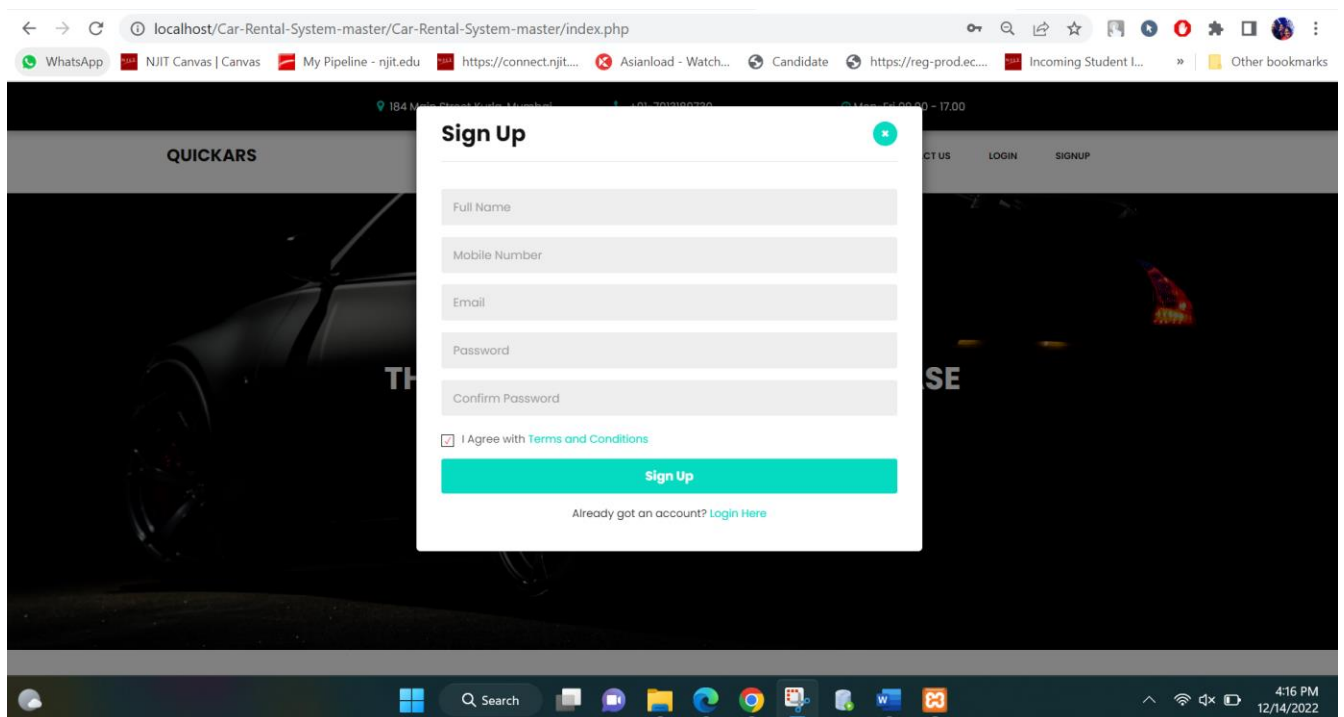


Fig.2 Sign up page

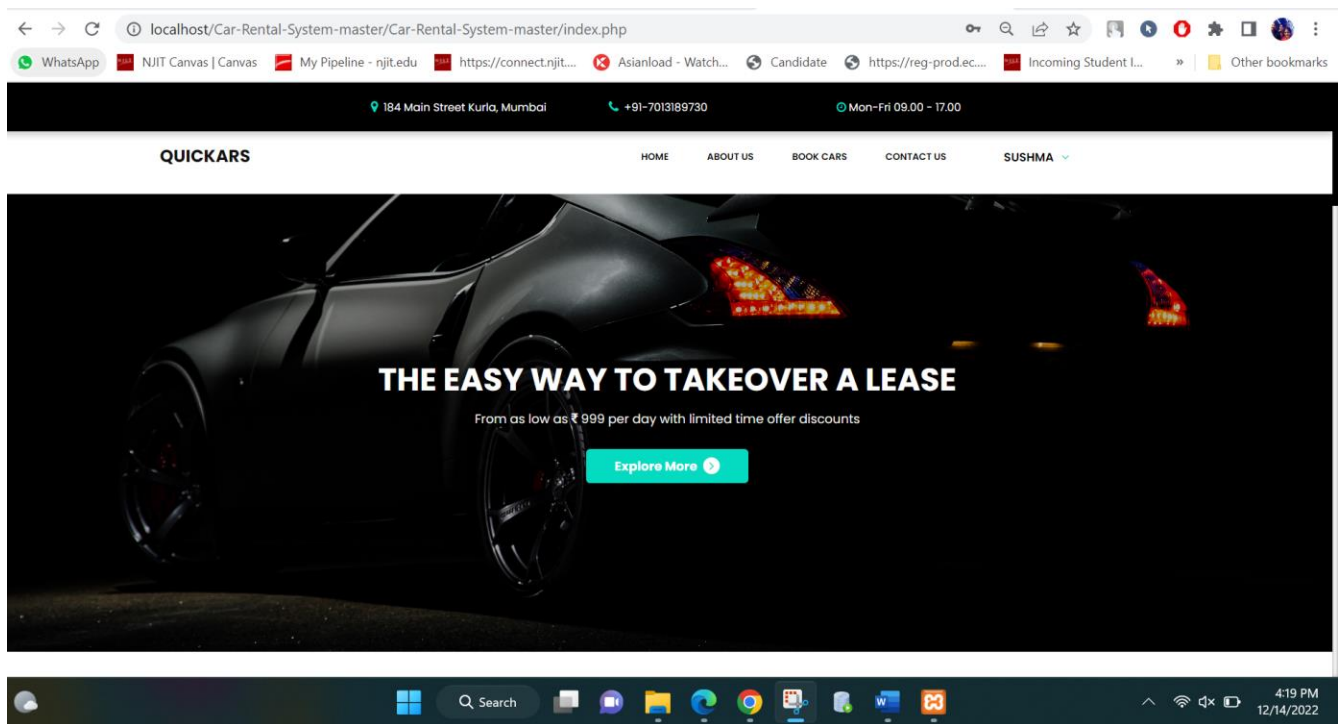


Fig.3 After Login Page

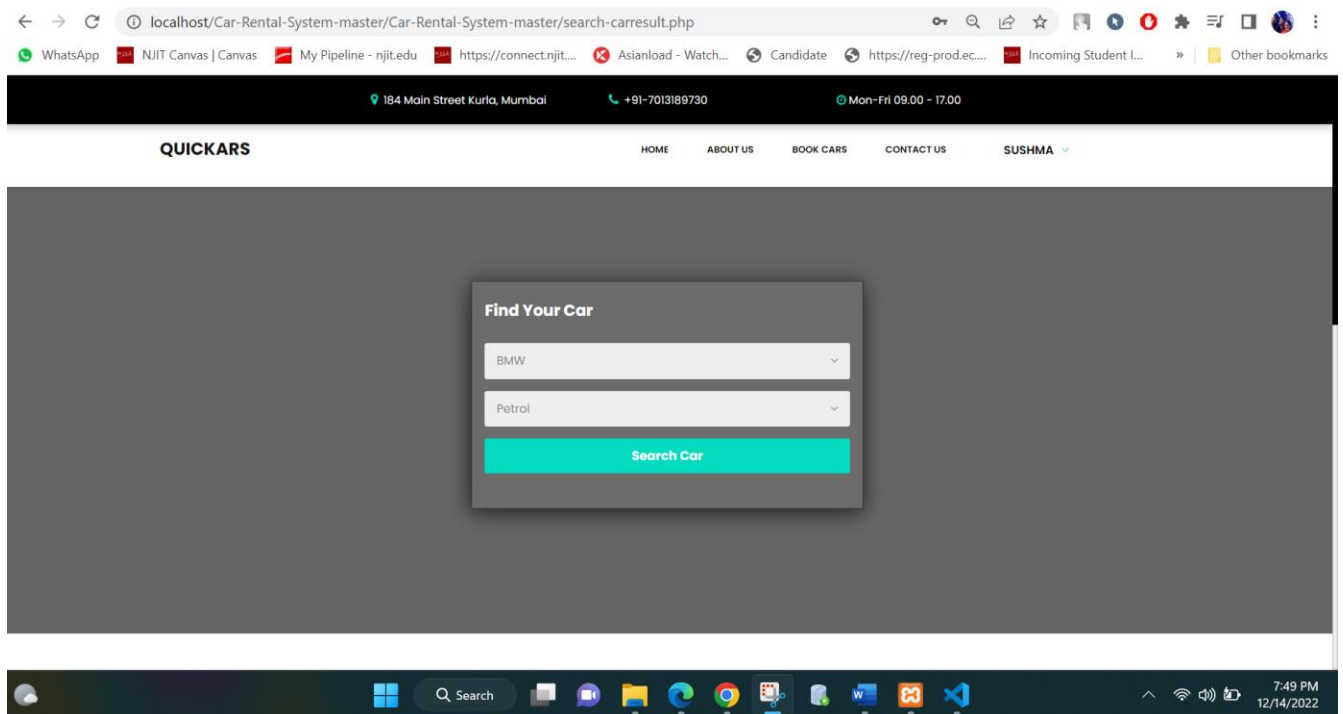


Fig.4 Searching for a car

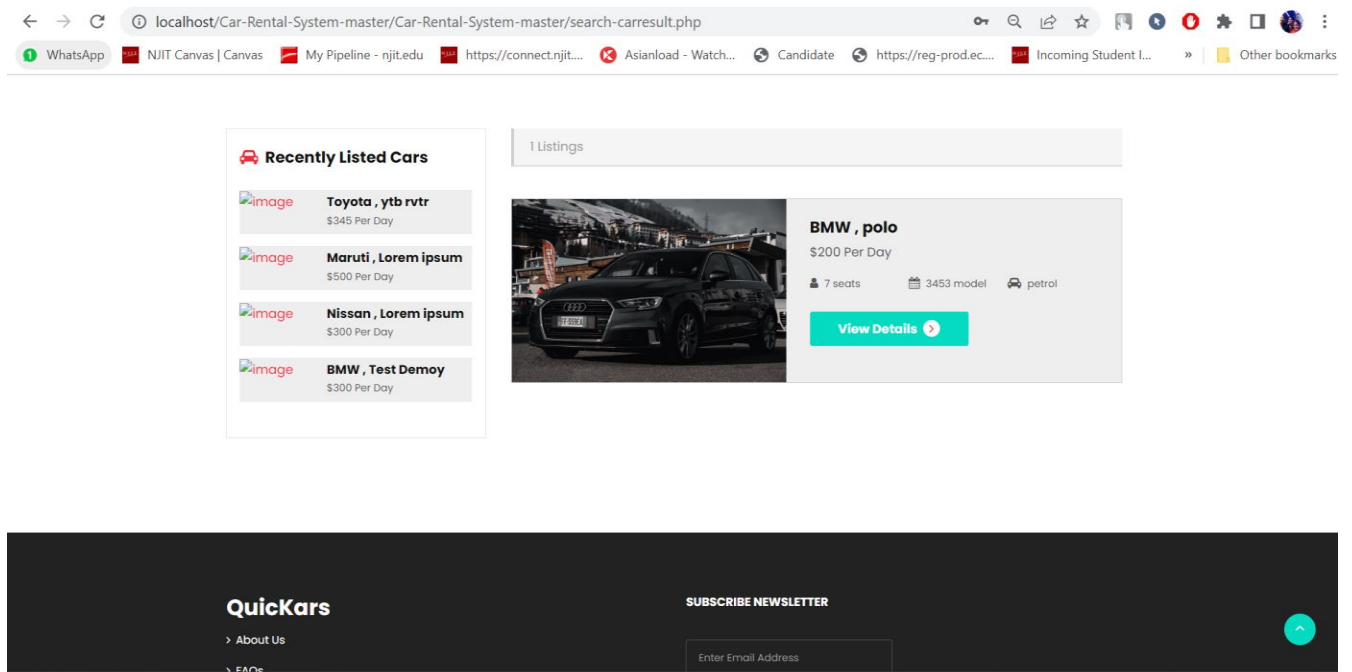


Fig.5 Output for the Search

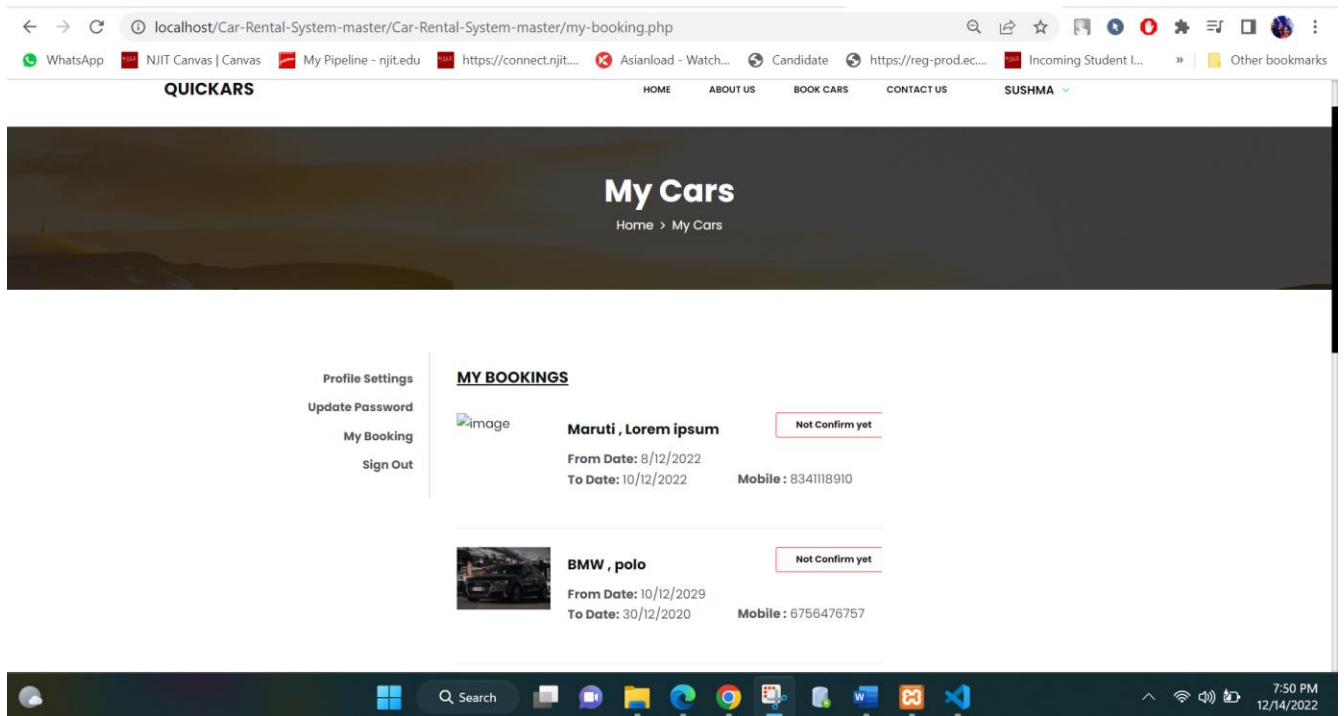


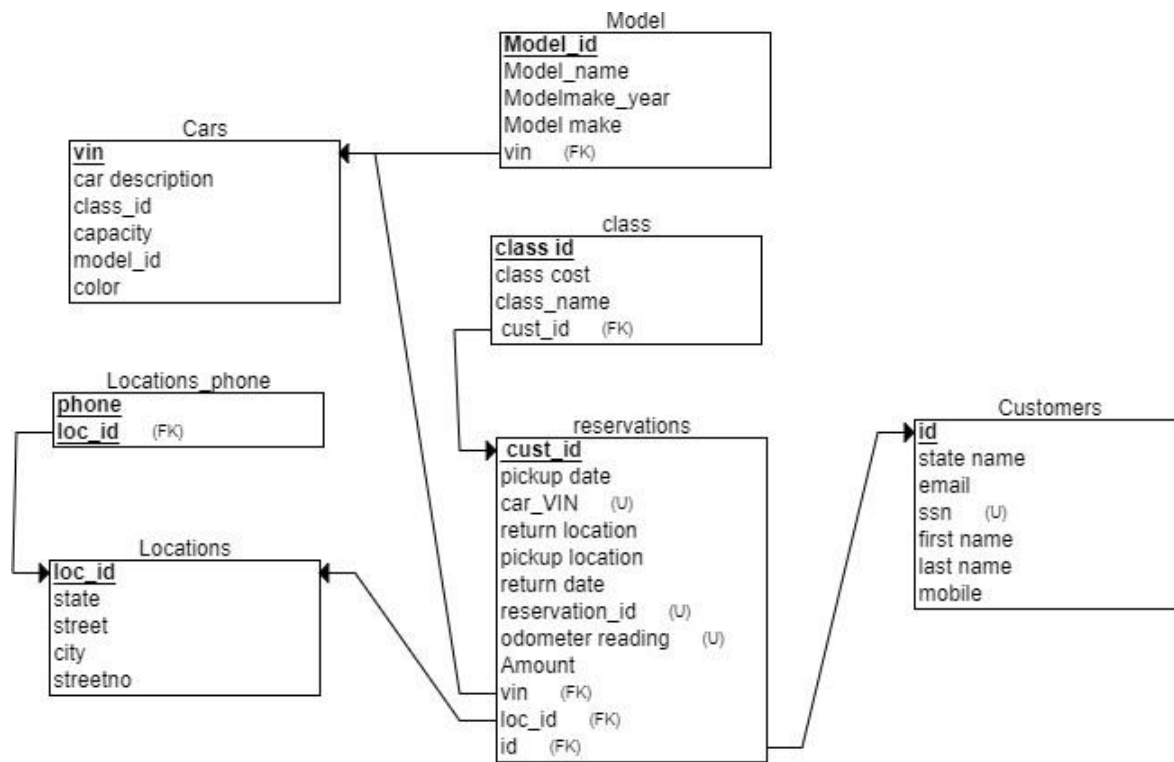
Fig.6 Booked Required car

3. Normalize and Relations:

a.) Write out the relation (schema) including all attribute names. Indicate keys and foreign

keys.

Sol.)



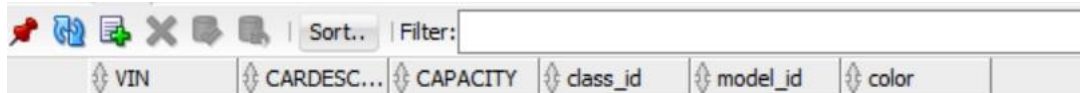
b.) Provide some sample data for the relation (5 rows)
sol.)

CREATION OF TABLES:

CARS:

CREATE TABLE "CARS"

```
(  "VIN" VARCHAR2(20 BYTE) NOT NULL ENABLE,  
  "CARDESCRIPTION" VARCHAR2(20 BYTE),  
  "CAPACITY" NUMBER,  
  "class_id" VARCHAR2(20 BYTE),  
  "model_id" VARCHAR2(20 BYTE),  
  "color" VARCHAR2(20 BYTE),  
  CONSTRAINT "CARS_PK" PRIMARY KEY ("VIN") );
```



A screenshot of a database table header for the 'CARS' table. The table has six columns: 'VIN', 'CARDESC...', 'CAPACITY', 'class_id', 'model_id', and 'color'. Each column header is preceded by a double-headed arrow icon, indicating that the columns are sortable. The interface includes a toolbar with icons for various database operations and a 'Filter:' input field.

VIN	CARDESC...	CAPACITY	class_id	model_id	color
-----	------------	----------	----------	----------	-------

CLASS:

CREATE TABLE "CLASS"

```
(  "CLASS_ID" NUMBER NOT NULL ENABLE,  
  "CLASS_NAME" VARCHAR2(20 BYTE),  
  "CLASS_COST" FLOAT(126),  
  "CUST_ID" NUMBER NOT NULL ENABLE,  
  CONSTRAINT "CLASS_PK" PRIMARY KEY ("CLASS_ID")  
  CONSTRAINT "CLASS_FK1" FOREIGN KEY ("CUST_ID") );
```




A screenshot of a database table header for the 'CLASS' table. The table has four columns: 'CLASS_ID', 'CLASS_N...', 'CLASS_C...', and 'CUST_ID'. Each column header is preceded by a double-headed arrow icon, indicating that the columns are sortable. The interface includes a toolbar with icons for various database operations and a 'Filter:' input field.

CLASS_ID	CLASS_N...	CLASS_C...	CUST_ID
----------	------------	------------	---------

CUSTOMERS:

CREATE TABLE "CUSTOMERS"

```
(  "CUST_ID" NUMBER NOT NULL ENABLE,  
    "FIRST_NAME" VARCHAR2(20 BYTE),  
    "LAST_NAME" VARCHAR2(20 BYTE),  
    "MOBILE" NUMBER,  
    "SSN" NUMBER NOT NULL ENABLE,  
    "STATE_NAME" VARCHAR2(20 BYTE),  
    "EMAIL" VARCHAR2(20 BYTE),  
    CONSTRAINT "CUSTOMERS_PK" PRIMARY KEY ("CUST_ID") );
```



The screenshot shows a database table interface for the 'CUSTOMERS' table. The table has the following columns: CUST_ID, FIRST_NAME, LAST_NAME, MOBILE, SSN, STATE NAME, and EMAIL. The interface includes a toolbar with icons for various actions and a 'Filter' input field.

CUST_ID	FIRST_NAME	LAST_NAME	MOBILE	SSN	STATE NAME	EMAIL
---------	------------	-----------	--------	-----	------------	-------

LOCATIONS:

CREATE TABLE "LOCATIONS"

```
(  "LOC_ID" NUMBER NOT NULL ENABLE,  
    "STATE" VARCHAR2(20 BYTE),  
    "STREET" VARCHAR2(20 BYTE),  
    "CITY" VARCHAR2(20 BYTE),  
  
    "ZIP CODE" VARCHAR2(20 BYTE),  
  
    CONSTRAINT "LOCATIONS_PK" PRIMARY KEY ("LOC_ID") );
```

<div> </div> <div>Sort.. Filter:</div>					
LOC_ID	STATE	STREET	CITY	ZIP CODE	

LOCATIONS_PHONE:

CREATE TABLE "LOCATIONS_PHONE"

```
(
    "PHONE" NUMBER NOT NULL ENABLE,
    "LOC_ID" NUMBER NOT NULL ENABLE,
    CONSTRAINT "LOCATIONS_PHONE_PK" PRIMARY KEY ("PHONE")
    CONSTRAINT "LOCATIONS_PHONE_FK1" FOREIGN KEY ("LOC_ID") ;
```

<div> </div> <div>Sort.. Filter:</div>	
PHONE	LOC_ID

MODEL:

CREATE TABLE "MODEL"

```
(
    "MODEL_ID" NUMBER NOT NULL ENABLE,
    "MODELMAKE" VARCHAR2(20 BYTE),
    "MODEL_NAME" VARCHAR2(20 BYTE),
    "MODELMAKE_YEAR" NUMBER,
    "VIN" VARCHAR2(30 BYTE) NOT NULL ENABLE,
    CONSTRAINT "MODEL_PK" PRIMARY KEY ("MODEL_ID")
    CONSTRAINT "MODEL_FK" FOREIGN KEY ("VIN") );
```

Columns	Data	Model	Constraints	Grants	Statistics	Triggers	Flashback	Dependencies	Details	Partitions	Index
<div> </div> <div>Sort.. Filter:</div>											
MODEL_ID	MODELMAKE	MODEL_N...	MODELMAKE_YEAR	VIN							

RESERVATIONS:

CREATE TABLE "RESERVATIONS"

```
(
  "CUSTOMER_ID" NUMBER NOT NULL ENABLE,
  "CAR_VIN" VARCHAR2(20 BYTE) NOT NULL ENABLE,
  "RESERVATION_ID" NUMBER NOT NULL ENABLE,
  "ODOMETERREADING" NUMBER NOT NULL ENABLE,
  "RETURNDATE" VARCHAR2(20 BYTE),
  "PICKUPDATE" VARCHAR2(20 BYTE),
  "TIME" VARCHAR2(20 BYTE),
  "class_id" VARCHAR2(20 BYTE),
  "LOC_ID" NUMBER,
  "pickup location" VARCHAR2(20 BYTE),
  "Return location" VARCHAR2(20 BYTE),
  "Amount" VARCHAR2(20 BYTE),
  CONSTRAINT "RESERVATIONS_PK" PRIMARY KEY ("RESERVATION_ID")
  CONSTRAINT "RESERVATIONS_FK1" FOREIGN KEY ("CUSTOMER_ID")
  REFERENCES "CUSTOMERS" ("CUST_ID") ENABLE,
  CONSTRAINT "RESERVATIONS_FK2" FOREIGN KEY ("CAR_VIN")
  REFERENCES "CARS" ("VIN") ENABLE,
  CONSTRAINT "RESERVATIONS_FK3" FOREIGN KEY ("CUSTOMER_ID")
  REFERENCES "CLASS" ("CLASS_ID") ENABLE,
  CONSTRAINT "RESERVATIONS_FK4" FOREIGN KEY ("LOC_ID")
  REFERENCES "LOCATIONS" ("LOC_ID") ENABLE );
```

CUSTOMER...	CAR_VIN	RESERVA...	ODOMETE...	RETURN...	PICKUP...	TIME	class_id	LOC_ID	pickup loc...	Return loc...	Amount
-------------	---------	------------	------------	-----------	-----------	------	----------	--------	---------------	---------------	--------

INSERTING VALUES INTO TABLES:

Cars:


```

INSERT INTO CARS VALUES ('MAHI007', 'MAHINDRA XUV500',4,1,01,'WHITE');
INSERT INTO CARS VALUES ('KAI014','SONET HTX',4,2,02,'BLUE');
INSERT INTO CARS VALUES ('DO0070','MERCEDES BENZ',6,3,03,'BLACK');
INSERT INTO CARS VALUES ('CHENYOL027','MINI COOPER',4,4,04,'GREEN');
INSERT INTO CARS VALUES ('CHEN011','AUDI A8',4,5,05,'WHITE');
INSERT INTO CARS VALUES ('LEE021','MUSTANG',4,6,06,'RED');
SELECT*FROM CARS;

```

Script Output x

Query Result x

 All Rows Fetched: 6 in 0.018 seconds

	VIN	CARDESCRIPTION	CAPACITY	class_id	model_id	color
1	MAHI007	MAHINDRA XUV500	4	1	1	WHITE
2	KAI014	SONET HTX	4	2	2	BLUE
3	DO0070	MERCEDES BENZ	6	3	3	BLACK
4	CHENYOL027	MINI COOPER	4	4	4	GREEN
5	CHEN011	AUDI A8	4	5	5	WHITE
6	LEE021	MUSTANG	4	6	6	RED

CLASS:

```

INSERT INTO CLASS VALUES (1,'DAILY',50,1001);
INSERT INTO CLASS VALUES (2,'Weekly',100,1006);
INSERT INTO CLASS VALUES (3,'DAILY',50,1002);
INSERT INTO CLASS VALUES (4,'DAILY',50,1003);
INSERT INTO CLASS VALUES (5,'Weekly',100,1004);
INSERT INTO CLASS VALUES (6,'Weekly',100,1005);
SELECT * FROM CLASS;

```

Script Output x Query Result x Query Result 1 x				
SQL All Rows Fetched: 6 in 0.011 seconds				
	CLASS_ID	CLASS_NAME	CLASS_COST	CUST_ID
1	1	DAILY	50	1001
2	2	Weekly	100	1006
3	3	DAILY	50	1002
4	4	DAILY	50	1003
5	5	Weekly	100	1004
6	6	Weekly	100	1005

LOCATIONS:

```
INSERT INTO LOCATIONS VALUES(003,'New Jersey','Wallis','Jersey City',07306);
```

```
INSERT INTO LOCATIONS VALUES(001,'Texas','Wales','Dallas',75001);
```

```
INSERT INTO LOCATIONS VALUES(003,'New Jersey','Sip','Jersey City',07306);
```

```
INSERT INTO LOCATIONS VALUES(004,'California','Martin','Los Angeles',07101);
```

```
INSERT INTO LOCATIONS VALUES(005,'New York','33rd','Time square',10037);
```

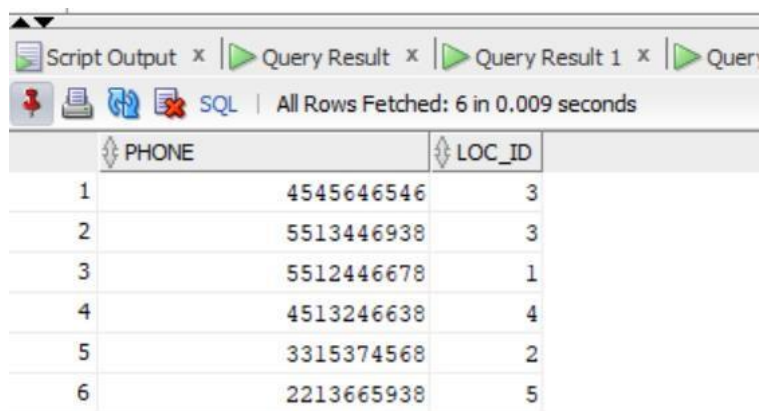
```
INSERT INTO LOCATIONS VALUES(002,'Florida','14th','Tampa',10036);
```

```
SELECT*FROM LOCATIONS;
```

Script Output x Query Result x Query Result 1 x Query Result 2 x Query Result 3 x					
SQL All Rows Fetched: 5 in 0.01 seconds					
	LOC_ID	STATE	STREET	CITY	ZIP CODE
1	3	New Jersey	Wallis	Jersey City	7306
2	1	Texas	Wales	Dallas	75001
3	4	California	Martin	Los Angeles	7101
4	5	New York	33rd	Time square	10037
5	2	Florida	14th	Tampa	10036

LOCATIONS_PHONE:

```
INSERT INTO LOCATIONS_PHONE VALUES(5513446938,003);
INSERT INTO LOCATIONS_PHONE VALUES(5512446678,001);
INSERT INTO LOCATIONS_PHONE VALUES(4513246638,004);
INSERT INTO LOCATIONS_PHONE VALUES(3315374568,002);
INSERT INTO LOCATIONS_PHONE VALUES(2213665938,005);
INSERT INTO LOCATIONS_PHONE VALUES(5513446938,003);
SELECT * FROM LOCATIONS_PHONE;
```



The screenshot shows a SQL query result window with the following data:

	PHONE	LOC_ID
1	4545646546	3
2	5513446938	3
3	5512446678	1
4	4513246638	4
5	3315374568	2
6	2213665938	5

MODEL:

```
INSERT INTO MODEL VALUES(01,'MAHINDRA','XUV500 W9','2021','MAHI007');
INSERT INTO MODEL VALUES(02,'KIA','SONET HTX','2020','KAY014');
INSERT INTO MODEL VALUES(03,'MERCEDES BENZ','C220D','2021','DO0070');
INSERT INTO MODEL VALUES(04,'MINICOOPER','S','2019','CHENYEOL027');
INSERT INTO MODEL VALUES(05,'AUDI','A8','2022','CHEN011');
INSERT INTO MODEL VALUES(06,'FORD','MUSTANG','2022','LEE021');
SELECT * FROM MODEL;
```


Script Output x Query Result x Query Result 1 x Query Result 2 x Query Result 3 x					
SQL All Rows Fetched: 6 in 0.009 seconds					
	MODEL_ID	MODELMAKE	MODEL_NAME	MODELMAKE_YEAR	VIN
1	1	MAHINDRA	XUV500 W9	2021	MAHI007
2	2	KIA	SONET HTX	2020	KAY014
3	3	MERCEDES BENZ	C220D	2021	DO0070
4	4	MINICOOPER	S	2019	CHENYEOL027
5	5	AUDI	A8	2022	CHEN011
6	6	FORD	MUSTANG	2022	LEE021

CUSTOMERS:

```
INSERT INTO CUSTOMERS VALUES(1001,'MAHESH','GHATTAMENENI',5783446938,123456789,'NEW JERSEY','MAHESH07@GMAIL.COM');
```

```
INSERT INTO CUSTOMERS VALUES(1002,'NANI','GHANTA',551223678,123454589,'NEW JERSEY','NANI24@GMAIL.COM');
```

```
INSERT INTO CUSTOMERS VALUES(1003,'MIKE','WHEELER',4513426638,321456789,'NEW YORK','MIKE@GMAIL.COM');
```

```
INSERT INTO CUSTOMERS VALUES(1004,'WILL','BYERS',3356374568,123890789,'TEXAS','BYERS_WILL@GMAIL.COM');
```

```
INSERT INTO CUSTOMERS VALUES(1005,'JOE','KEERY',221785938,128566789,'CALIFORNIA','JOE@GMAIL.COM');
```

```
INSERT INTO CUSTOMERS VALUES(1006,'JIM','HOPPER',5513986938,196736789,'FLORIDA','MAHESH07@GMAIL.COM');
```

```
SELECT * FROM CUSTOMERS;
```


c.) State the Key for the relation and write down Functional Dependencies.

Sol.)

Relations:

Cars -> Vin

Model -> Model_id

Class -> class_id

Reservations -> cust_id

Customers -> id

Locations -> id

Functional Dependencies:

Cars -> Model

Cars -> reservations

Reservations -> class

Reservations -> customers

Locations -> Locations_phone

d.) State that this relation is in 3NF.

If a relation fails to meet the definition of a third normal form (e.g., it contains a partial-key dependency or it contains a transitive dependency), then split the relation into new relations.

Begin the normalization process from the beginning with each of these new relations.

Sol.) Already in 3rd normal form if tables are broken there will be useless relations.

4- Write four queries in English and answer in SQL code, show a screen dump or SNIP that shows the SQL code and the result (You may use the same queries from Phase II).

Write four SQL Queries;

1 contains GROUP BY

1 contains GROUP BY and HAVING

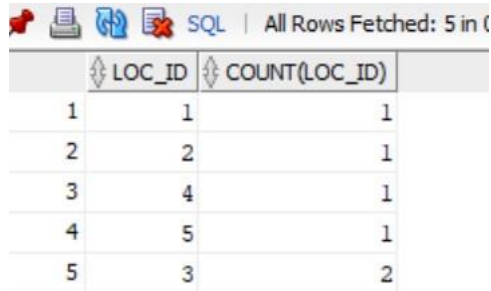
1 contains nested query with ALL

1 contains nested query with IN

Sol.)

GROUP BY:

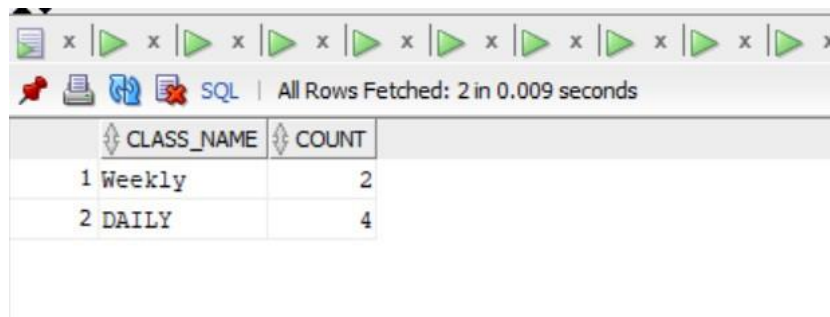
SELECT LOC_ID,COUNT(LOC_ID) FROM LOCATIONS_PHONE GROUP BY LOC_ID;



	LOC_ID	COUNT(LOC_ID)
1	1	1
2	2	1
3	4	1
4	5	1
5	3	2

GROUP BY HAVING:

SELECT CLASS_NAME,COUNT(CLASS_ID) AS COUNT FROM CLASS GROUP BY CLASS_NAME HAVING COUNT(CLASS_ID)>0;

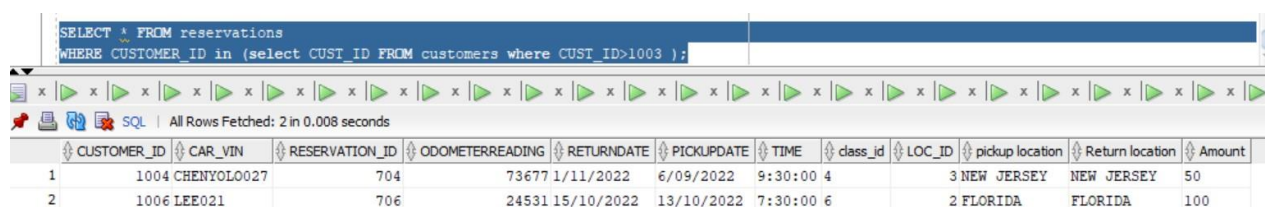


	CLASS_NAME	COUNT
1	Weekly	2
2	DAILY	4

NESTED QUERRIES IN:

SELECT * FROM reservations

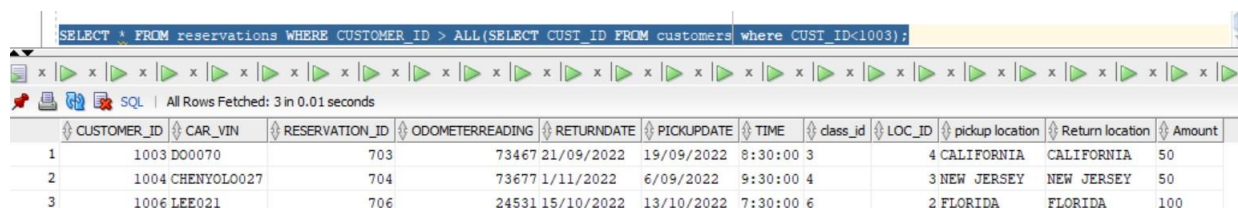
WHERE CUSTOMER_ID in (select CUST_ID FROM customers where CUST_ID>1003);



	CUSTOMER_ID	CAR_VIN	RESERVATION_ID	ODOMETERREADING	RETURNDATE	PICKUPDATE	TIME	class_id	LOC_ID	pickup location	Return location	Amount
1	1004	CHENYOL0027	704	734677	1/11/2022	6/09/2022	9:30:00	4	3	NEW JERSEY	NEW JERSEY	50
2	1006	LEE021	706	24531	15/10/2022	13/10/2022	7:30:00	6	2	FLORIDA	FLORIDA	100

NESTED QUERRIES ALL:

SELECT * FROM reservations WHERE CUSTOMER_ID > ALL(SELECT CUST_ID FROM customers where CUST_ID<1003);



	CUSTOMER_ID	CAR_VIN	RESERVATION_ID	ODOMETERREADING	RETURNDATE	PICKUPDATE	TIME	class_id	LOC_ID	pickup location	Return location	Amount
1	1003	DO0070	703	734677	21/09/2022	19/09/2022	8:30:00	3	4	CALIFORNIA	CALIFORNIA	50
2	1004	CHENYOL0027	704	734677	1/11/2022	6/09/2022	9:30:00	4	3	NEW JERSEY	NEW JERSEY	50
3	1006	LEE021	706	24531	15/10/2022	13/10/2022	7:30:00	6	2	FLORIDA	FLORIDA	100

5- A narrative conclusion section that describes:

a) the group's experience with the project (which steps were the most difficult? Which were the easiest? what did you learn that you did not imagine you would have? if you had to do it all over again, what would you have done differently?)

sol.)

- **Difficult Part:**

We faced difficulties as a group how to give connections in the database and how to create a mechanism for this database. How to set the foreign and primary keys for every table and how to connect the database with the web pages and how to create the logic of group by queries.

- **Easiest Part:**

Easiest part in this project when we design the schema and according to schema creating database is the most easiest part in this project through this we come to know if we first develop the schema then we easily create and develop the diagram and another easiest part as we are talking about as a group we divide the whole work into two portion and then start working on this through this we easily manage the whole project.

- **Learnings:**

We learned so many things in this project like connecting databases with web pages and how to import or extract the database from phpmyadmin and in mysql. Through this our concepts of group by, having and joins queries is more cleared now. We also learned how to set properly the concept of primary keys and foreign keys

b) any final comments and conclusions.

Sol.)

Working on same project in future: If in future, I'll work in this project then we will add the concept of admin page and images of the car.

