# DATABASE MANAGEMENT SYSTEMS DESIGN
## CS 6311J2 – RENT A CAR
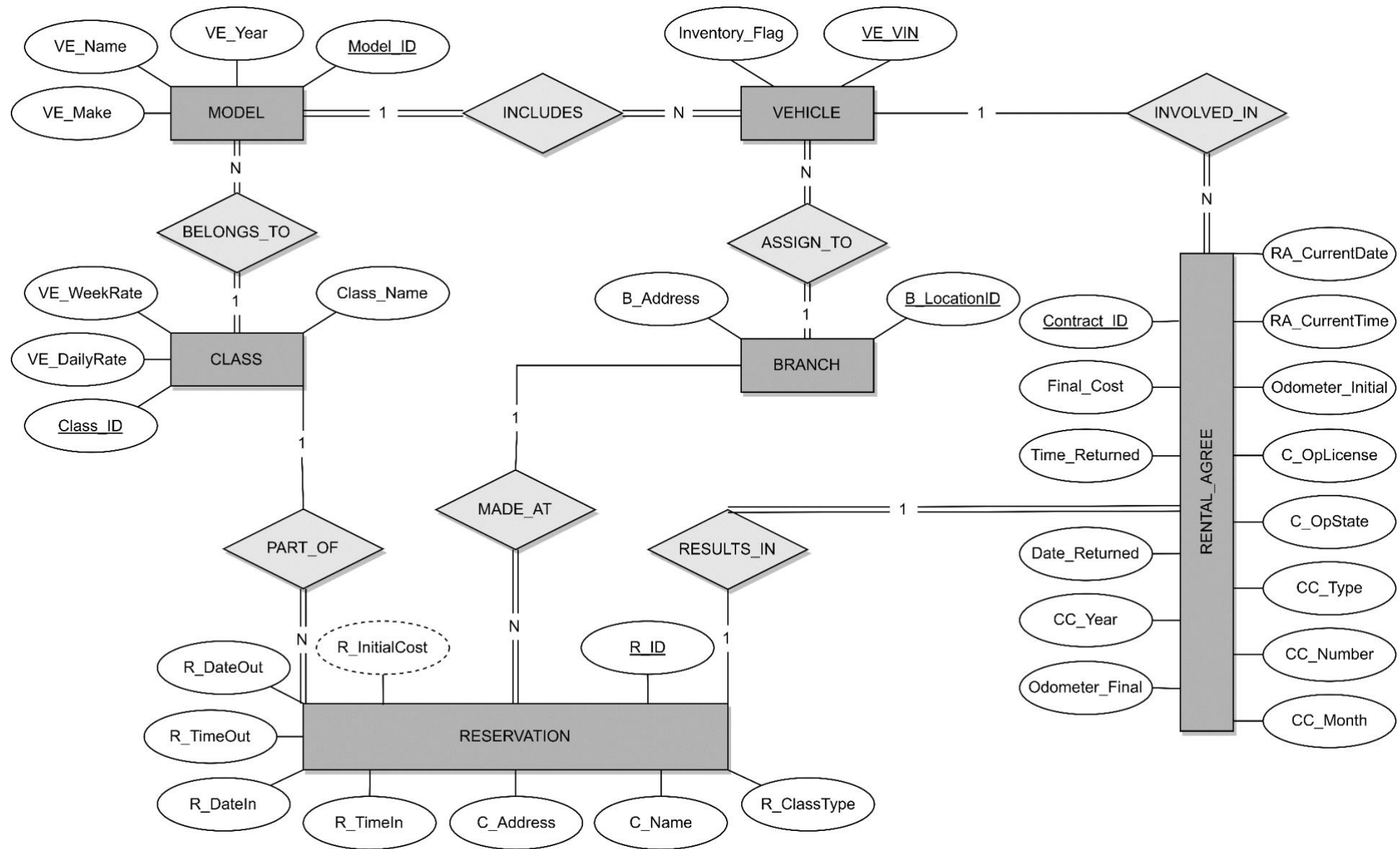## FINAL REPORT

**GROUP 4**
**DAVID GOMEZ CAMARGO (dsg9@njit.edu)**
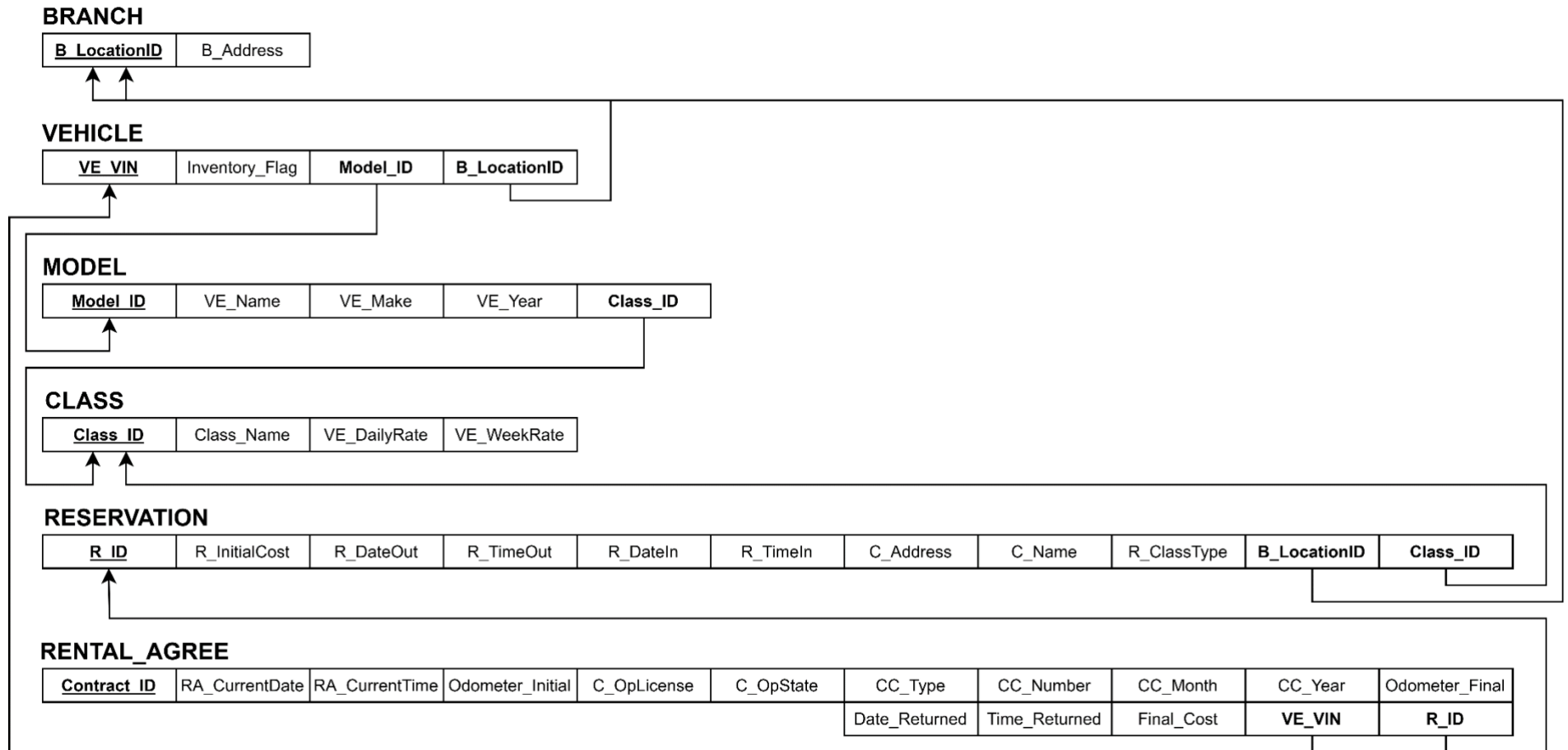**RAJA PERICHIAPPAN (rp937@njit.edu)**

# 1. INTRODUCTION

**RentACar** wishes to implement a database to control all aspects of its operations, including tracking car inventories, rental contracts, and billing. The following statements of business rules and relationships are used to construct a relational model:

- Each VEHICLE is uniquely identified by a Vehicle Identification Number (VIN). When customers make a reservation there needs to be a vehicle available for rent. Therefore, vehicles have an additional attribute to show the availability. It could be 'Y' if available, 'R' if reserved, 'C' if confirmed.

- Each vehicle description includes a MODEL that consist of the make (i.e., Ford, Honda…), year and name.

- Each model belongs to a CLASS with two different rental rates: daily and weekly rate. Rental prices are determined based on the class (i.e., Van, Pickup Truck, Mid-size car, SUV…).

- Each vehicle is assigned to a BRANCH and each branch can have one or more vehicles. Branch is identified by a unique Location ID and includes an address.

- RESERVATION carries the details about Customer name, address, class type (daily or weekly rental), rate, and duration of the rental with start and end time. A reservation is made for the pickup of a particular class at a specific branch.

- RESERVATION, MODEL and CLASS would have an artificial ID that increments by 1 from maximum value and serves to uniquely identify each entry.

- When a reservation is confirmed, a RENTAL AGREEMENT is made. A reservation gets confirmed when the customer arrives to the branch to pick up the car. Rental Agreement is uniquely identified by the Contract ID, includes the vehicle VIN, current date, and time for the rental to start and initial odometer reading. Entity also carries customer information: license number, state that issued the license, credit card number, type (i.e., Visa, MasterCard…), expiration month and year.

- When vehicle is returned, the rental agreement incorporates information such as final odometer reading, date and time returned, and final rental rate. This forms the complete operations cycle.

# 2. ENTITY-RELATIONSHIP (ER) SCHEMA

# 3. RELATIONAL MODEL

**BRANCH**

| B_LocationID | B_Address |
| --- | --- |

**VEHICLE**

| VE_VIN | Inventory_Flag | Model_ID | B_LocationID |
| --- | --- | --- | --- |

**MODEL**

| Model_ID | VE_Name | VE_Make | VE_Year | Class_ID |
| --- | --- | --- | --- | --- |

**CLASS**

| Class_ID | Class_Name | VE_DailyRate | VE_WeekRate |
| --- | --- | --- | --- |

**RESERVATION**

| R_ID | R_InitialCost | R_DateOut | R_TimeOut | R_DateIn | R_TimeIn | C_Address | C_Name | R_ClassType | B_LocationID | Class_ID |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

**RENTAL_AGREE**

| Contract_ID | RA_CurrentDate | RA_CurrentTime | Odometer_Initial | C_OpLicense | C_OpState | CC_Type | CC_Number | CC_Month | CC_Year | Odometer_Final |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | | | | | | Date_Returned | Time_Returned | Final_Cost | VE_VIN | R_ID |

# 4. SQL STATEMENTS TO CREATE DATABASE AND TABLES

```sql
CREATE TABLE BRANCH (
        B_LocationID        VARCHAR(15)        NOT NULL,
        B_Address           VARCHAR(50)        NOT NULL,
        PRIMARY KEY (B_LocationID));
/


CREATE TABLE VEHICLE (
        VE_VIN              VARCHAR(17)        NOT NULL,
        Inventory_Flag      VARCHAR(1)         NOT NULL,
        Model_ID            VARCHAR(15)        NOT NULL,
        B_LocationID        VARCHAR(15),
        PRIMARY KEY (VE_VIN),
        FOREIGN KEY (B_LocationID) REFERENCES BRANCH (B_LocationID) ON DELETE SET
        NULL);
/


CREATE TABLE MODEL (
        Model_ID            VARCHAR(15)        NOT NULL,
        VE_Name             VARCHAR(25)        NOT NULL,
        VE_Make             VARCHAR(15)        NOT NULL,
        VE_Year             INT                NOT NULL,
        Class_ID            VARCHAR(15)        NOT NULL,
        PRIMARY KEY (Model_ID));
/


ALTER TABLE VEHICLE ADD CONSTRAINT Veh_mod FOREIGN KEY (Model_ID) REFERENCES MODEL
(Model_ID);
/


CREATE TABLE CLASS (
        Class_ID            VARCHAR(15)        NOT NULL,
        Class_Name          VARCHAR(15)        NOT NULL,
        VE_DailyRate        DECIMAL(10,2)      NOT NULL,
        VE_WeekRate         DECIMAL(10,2)      NOT NULL,
        PRIMARY KEY (Class_ID));
/


ALTER TABLE MODEL ADD CONSTRAINT Mod_cla FOREIGN KEY (Class_ID) REFERENCES CLASS
(Class_ID);
/


CREATE TABLE RESERVATION (
        R_ID                VARCHAR(15)        NOT NULL,
        R_InitialCost       DECIMAL(10,2)      NOT NULL,
        R_DateOut           DATE               NOT NULL,
        R_TimeOut           INT                NOT NULL,
        R_DateIn            DATE               NOT NULL,
        R_TimeIn            INT                NOT NULL,
        C_Address           VARCHAR(50)        NOT NULL,
```

```
        C_Name              VARCHAR(30)              NOT NULL,
        R_ClassType         VARCHAR(15)              NOT NULL,
        B_LocationID        VARCHAR(15),
        Class_ID            VARCHAR(15),
        PRIMARY KEY (R_ID),
        FOREIGN KEY (B_LocationID) REFERENCES BRANCH (B_LocationID) ON DELETE SET
        NULL,
        FOREIGN KEY (Class_ID) REFERENCES CLASS (Class_ID) ON DELETE SET NULL);
/


CREATE TABLE RENTAL_AGREE (
        Contract_VIN        VARCHAR(15)              NOT NULL,
        RA_CurrentDate      DATE                     NOT NULL,
        RA_CurrentTime      INT                      NOT NULL,
        Odometer_Initial    INT                      NOT NULL,
        C_OpLicense         VARCHAR(15)              NOT NULL,
        C_OpState           VARCHAR(15)              NOT NULL,
        CC_Type             VARCHAR(15)              NOT NULL,
        CC_Number           INT                      NOT NULL,
        CC_Month            INT                      NOT NULL,
        CC_Year             INT                      NOT NULL,
        Odometer_Final      INT,
        Date_Returned       DATE,
        Time_Returned       INT,
        Final_Cost          DECIMAL(10,2),
        VE_VIN              VARCHAR(17),
        R_ID                VARCHAR(15),
        PRIMARY KEY (Contract_VIN),
        FOREIGN KEY (VE_VIN) REFERENCES VEHICLE (VE_VIN) ON DELETE SET NULL,
        FOREIGN KEY (R_ID) REFERENCES RESERVATION (R_ID) ON DELETE SET NULL);
/
```

# 5. SAMPLE DATA

## 5.1. BRANCH

| | B_LOCATIONID | B_ADDRESS |
|---|---|---|
| 1 | NY8791 | 8791 Homewood St, New York, NY 10025 |
| 2 | BRI485 | 485 Briarwood St, New York, NY 10029 |
| 3 | CRE838 | 838 Creekside St, Bronx, NY 10469 |
| 4 | WES704 | 704 Beach Ave, Westbury, NY 11590 |
| 5 | BR9105 | 9105 Aspen St, Brooklyn, NY 11230 |
| 6 | BR9987 | 9987 Hill Lane, Brooklyn, NY 11218 |

**Query Result SQL** [X]

RentACar : SELECT * FROM BRANCH

Copy..

## 5.2. VEHICLE

| | VE_VIN | INVENTORY_FLAG | MODEL_ID | B_LOCATIONID |
|---|---|---|---|---|
| 1 | WBSPM9C52BE202514 | A | BU89_CEN | NY8791 |
| 2 | 5NPEB4AC1DH576656 | A | BU92_REG | NY8791 |
| 3 | 1GNEL19X73B130926 | A | AC95_INT | NY8791 |
| 4 | JH4DA1844GS001970 | A | GM03_SIE | NY8791 |
| 5 | 2FMDK4KC4CBA27842 | A | CH04_SIE | NY8791 |
| 6 | JH4DC4450SS003654 | R | FO05_E35 | NY8791 |
| 7 | 5FNRL38209B014050 | A | HO09_ODY | NY8791 |
| 8 | 2G4WB54T1N1466114 | A | SE10_SAT | NY8791 |
| 9 | 1GNKVGED5CJ196120 | A | HY10_ELA | NY8791 |
| 10 | 1C4RJFBG5DC522189 | A | LI12_MKZ | NY8791 |

**Query Result SQL** [×]

RentACar : SELECT * FROM VEHICLE

Copy..

| | VE_VIN | INVENTORY_FLAG | MODEL_ID | B_LOCATIONID |
|---|---|---|---|---|
| 80 | 5TFUM5F18AX006026 | A | GM99_SIE | BR9987 |
| 81 | 2P4GH2535SR296546 | A | FR04_M2 | BR9987 |
| 82 | JH4DA9460PS008002 | A | FO05_E35 | BR9987 |
| 83 | 1B3EJ46X8WN257032 | A | SU06_XL7 | BR9987 |
| 84 | ZAMCE39A060023181 | A | IS09_NPR | BR9987 |
| 85 | JH4DB7650SS002893 | A | BM11_M3 | BR9987 |
| 86 | JH4DA9360MS000737 | A | CH14_SIL | BR9987 |
| 87 | JH4DC4340SS001220 | R | AC16_LEG | BR9987 |
| 88 | 1FUJBGAN04HM86987 | A | FO17_F15 | BR9987 |
| 89 | JH4DC4340RS000837 | A | HY19_ELA | BR9987 |
| 90 | 3VWDZ7AJ7BM373945 | A | LI22_MKZ | BR9987 |

## 5.3. MODEL

| | MODEL_ID | VE_NAME | VE_MAKE | VE_YEAR | CLASS_ID |
|---|---|---|---|---|---|
| 1 | AC86_INT | Integra | Acura | 1986 | SUV04 |
| 2 | CA87_DEV | DeVille | Cadillac | 1987 | LUX04 |
| 3 | AC88_INT | Integra | Acura | 1988 | LUX02 |
| 4 | BU89_CEN | Century | Buick | 1989 | HYB01 |
| 5 | AC91_INT | Integra | Acura | 1991 | LUX01 |
| 6 | BU92_REG | Regal | Buick | 1992 | COM01 |
| 7 | BU92_PAR | Park Avenue | Buick | 1992 | LUX03 |
| 8 | AC95_INT | Integra | Acura | 1995 | LUX02 |
| 9 | PO95_GRA | Grand Am | Pontiac | 1995 | SPO01 |
| 10 | GM99_SIE | Sierra 1500 | GMC | 1999 | SUV02 |

| | | | | | |
|---|---|---|---|---|---|
| 39 | AC16_INT | Integra | Acura | 2016 | SUV02 |
| 40 | CH17_CAP | Caprice | Chevrolet | 2017 | VAN01 |
| 41 | FO17_F15 | F 150 | Ford | 2017 | MID02 |
| 42 | HY19_ELA | Elantra | Hyundai | 2019 | SED01 |
| 43 | HO19_ODY | Odyssey | Honda | 2019 | SUV01 |
| 44 | AC20_INT | Integra | Acura | 2020 | LUX03 |
| 45 | BM21_M3 | M3 | BMW | 2021 | ELE01 |
| 46 | FO22_EDG | Edge | Ford | 2022 | HYB01 |
| 47 | LI22_MKZ | MKZ | Lincoln | 2022 | HYB01 |
| 48 | HY23_SON | Sonata | Hyundai | 2023 | ELE01 |
| 49 | CH23_AST | Astro | Chevrolet | 2023 | HYB01 |

## 5.4. CLASS

| | CLASS_ID | CLASS_NAME | VE_DAILYRATE | VE_WEEKRATE |
|---|---|---|---|---|
| 1 | COM01 | Compact | 81.1 | 429.83 |
| 2 | COM02 | Compact | 88.81 | 470.69 |
| 3 | COM03 | Compact | 89.88 | 476.36 |
| 4 | ELE01 | Electric | 134.34 | 712 |
| 5 | ELE02 | Electric | 145.59 | 771.63 |
| 6 | ELE03 | Electric | 153.39 | 812.97 |
| 7 | HYB01 | Hybrid | 153.49 | 813.5 |
| 8 | HYB02 | Hybrid | 155.75 | 825.48 |
| 9 | HYB03 | Hybrid | 158.84 | 841.85 |
| 10 | LUX01 | Luxury | 184.53 | 978.01 |

| | | | | |
|---|---|---|---|---|
| 15 | MID02 | Mid-size | 113.19 | 599.91 |
| 16 | MIN01 | Minivan | 117.52 | 622.86 |
| 17 | SED01 | Sedan | 84.7 | 448.91 |
| 18 | SED02 | Sedan | 87.65 | 464.55 |
| 19 | SPO01 | Sports | 158.84 | 841.85 |
| 20 | SUV01 | SUV | 91.59 | 485.43 |
| 21 | SUV02 | SUV | 91.65 | 485.75 |
| 22 | SUV03 | SUV | 92.4 | 489.72 |
| 23 | SUV04 | SUV | 94.22 | 499.37 |
| 24 | VAN01 | Van | 142.75 | 756.58 |
| 25 | VAN02 | Van | 144.78 | 767.33 |

## 5.5. RESERVATION

| | R_ID | R_INITIALCOST | R_DATEOUT | R_TIMEOUT | R_DATEIN | R_TIMEIN | C_ADDRESS |
|---|---|---|---|---|---|---|---|
| 1 | 001LUX02 | 2006.13 | 2022-01-11 | 14 | 2022-01-23 | 10 | 675 Birchwood St |
| 2 | 002SED01 | 957.11 | 2022-02-11 | 14 | 2022-02-24 | 10 | 7155 Hillside St |
| 3 | 003SUV02 | 183.3 | 2022-03-01 | 12 | 2022-03-03 | 8 | 9861 Sunset Dr, |
| 4 | 004VAN01 | 2697.97 | 2022-03-08 | 15 | 2022-04-01 | 10 | 64 Lawrence Rd, |
| 5 | 005HYB01 | 3054.45 | 2022-03-11 | 10 | 2022-04-05 | 8 | 283 Lakeview Rd, |
| 6 | 006ELE01 | 846.34 | 2022-04-01 | 10 | 2022-04-09 | 9 | 67 Cedarwood Rd, |
| 7 | 007COM03 | 1878.49 | 2022-05-04 | 9 | 2022-05-30 | 9 | 7876 Durham Rd, |
| 8 | 008MIN01 | 705.12 | 2022-05-09 | 12 | 2022-05-15 | 8 | 8488 Hillcrest L |
| 9 | 009LUX04 | 4335.76 | 2022-05-25 | 11 | 2022-06-21 | 10 | 790 Walnutwood S |
| 10 | 010LUX02 | 2648.87 | 2022-06-03 | 13 | 2022-06-20 | 11 | 8333 Nut Swamp S |

**Query Result SQL** [X]

RentACar : SELECT * FROM RESERVATION

Copy..

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 40 | 040SED02 | 1279.69 | 2023-02-17 | 13 | 2023-03-07 | 9 | 214 Nichols St, Bronx |
| 41 | 041ELE01 | 2230.04 | 2023-02-22 | 15 | 2023-03-14 | 10 | 61 Theatre Court, Flu |
| 42 | 042LUX01 | 1956.01 | 2023-02-27 | 15 | 2023-03-13 | 14 | 7896 Myrtle Lane, Bro |
| 43 | 043SED02 | 552.19 | 2023-03-03 | 16 | 2023-03-11 | 13 | 7248 Branch St, New Y |
| 44 | 044VAN01 | 2226.9 | 2023-03-07 | 14 | 2023-03-26 | 11 | 75 Elizabeth Ave, Ham |
| 45 | 045LUX01 | 1531.59 | 2023-03-09 | 16 | 2023-03-19 | 15 | 26 Virginia Dr, Astor |
| 46 | 046LUX03 | 2468.34 | 2023-03-10 | 10 | 2023-03-26 | 10 | 94 Campfire Lane, Bro |
| 47 | 047SUV02 | 943.99 | 2023-03-13 | 14 | 2023-03-25 | 10 | 720 Canterbury Dr, As |
| 48 | 048ELE01 | 980.68 | 2023-03-23 | 16 | 2023-04-01 | 15 | 97 Rose Dr, Brooklyn, |
| 49 | 049SPO01 | 2160.22 | 2023-03-24 | 15 | 2023-04-10 | 14 | 2 Roberts Dr, Brookly |
| 50 | 050ELE01 | 268.68 | 2023-03-31 | 15 | 2023-04-02 | 10 | 127 East Central Ave, |

## 5.6. RENTAL AGREEMENT

| | CONTRACT_ID | RA_CURRENTDATE | RA_CURRENTTIME | ODOMETER_INITIAL | C_OPLICENSE | C_OPSTATE |
|---|---|---|---|---|---|---|
| 1 | 001_001LUX02 | 2022-01-11 | 14 | 68266 | T34223020071088 | NY |
| 2 | 002_002SED01 | 2022-02-11 | 13 | 76206 | G35212149867238 | NY |
| 3 | 003_003SUV02 | 2022-03-01 | 13 | 95145 | R84512068918451 | NY |
| 4 | 004_004VAN01 | 2022-03-08 | 16 | 154037 | M77802091986673 | CT |
| 5 | 005_005HYB01 | 2022-03-11 | 9 | 65410 | R33653890142234 | PA |
| 6 | 006_006ELE01 | 2022-04-01 | 12 | 185839 | F58167253952502 | NJ |
| 7 | 007_008MIN01 | 2022-05-09 | 11 | 179564 | P68088869117045 | PA |
| 8 | 008_009LUX04 | 2022-05-25 | 10 | 136920 | X87278869874753 | NY |
| 9 | 009_010LUX02 | 2022-06-03 | 12 | 98291 | K73275365394627 | NY |
| 10 | 010_011ELE02 | 2022-06-17 | 8 | 108784 | P00319495931797 | MA |

| 30 | 030_037LUX02 | 2023-02-07 | 17 | 85034 | X18537488133962 | NJ |
| 31 | 031_038ELE01 | 2023-02-15 | 8 | 158431 | C99425511278529 | NJ |
| 32 | 032_039ELE01 | 2023-02-16 | 12 | 185576 | L54999014392817 | NY |
| 33 | 033_040SED02 | 2023-02-17 | 12 | 177077 | W82669047504314 | NY |
| 34 | 034_042LUX01 | 2023-02-27 | 14 | 22483 | F12615982285093 | NY |
| 35 | 035_043SED02 | 2023-03-03 | 15 | 72171 | D80512323737570 | NY |
| 36 | 036_044VAN01 | 2023-03-07 | 14 | 146991 | Z77080254508989 | CT |
| 37 | 037_046LUX03 | 2023-03-10 | 9 | 26017 | L79386314565314 | MA |
| 38 | 038_047SUV02 | 2023-03-13 | 13 | 112922 | F32297960441847 | NY |
| 39 | 039_048ELE01 | 2023-03-23 | 17 | 118580 | C09899269379714 | NY |
| 40 | 040_049SPO01 | 2023-03-24 | 17 | 119255 | F65266717893112 | NY |
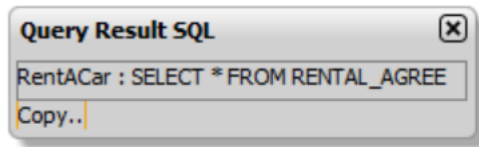
# 6. NORMALIZATION

All 6 relations *[BRANCH, VEHICLE, MODEL, CLASS, RESERVATION, RENTAL_AGREE]* are in
Third Normal Form since:

- All the tables are in the first normal form, meaning:
  - None of the attributes in any of the relations are composite.
  - All the attributes are single valued.
  - None of them are nested relations.
- All the tables are in the second normal form, meaning:
  - At first hand, they are in first normal form.
  - All the 6 relations are defined with a prime attribute K, in such a way that every
    other non-prime attribute A in the given relation R is fully functionally dependent on
    the primary key.
- None of the relations have transitive functional dependencies.
- Section 6.1. shows the above mentioned facts along with the functional dependencies.

| RELATION | KEY |
|----------|-----|
| BRANCH | B_LocationID |
| VEHICLE | VE_VIN |
| MODEL | Model_ID |
| CLASS | Class_ID |
| RESERVATION | R_ID |
| RENTAL_AGREE | Contract_ID |

## 6.1. FUNCTIONAL DEPENDENCIES

### BRANCH

| B_LocationID | B_Address |
|---|---|
| FD1 | |

### VEHICLE

| VE_VIN | Inventory_Flag | Model_ID | B_LocationID |
|---|---|---|---|
| FD2 | | | |

### MODEL

| Model_ID | VE_Name | VE_Make | VE_Year | Class_ID |
|---|---|---|---|---|
| FD3 | | | | |

### CLASS

| Class_ID | Class_Name | VE_DailyRate | VE_WeekRate |
|---|---|---|---|
| FD4 | | | |

### RESERVATION

| R_ID | R_InitialCost | R_DateOut | R_TimeOut | R_DateIn | R_TimeIn | C_Address | C_Name | R_ClassType | B_LocationID | Class_ID |
|---|---|---|---|---|---|---|---|---|---|---|
| FD5 | | | | | | | | | | |
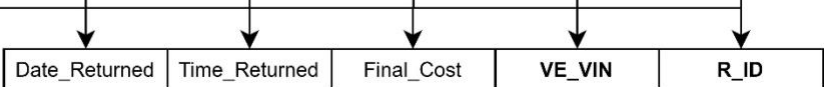
### RENTAL_AGREE

| Contract_ID | RA_CurrentDate | RA_CurrentTime | Odometer_Initial | C_OpLicense | C_OpState | CC_Type | CC_Number | CC_Month | CC_Year | Odometer_Final |
|---|---|---|---|---|---|---|---|---|---|---|
| FD6 | | | | | | | | | | |

| | | | | | | Date_Returned | Time_Returned | Final_Cost | VE_VIN | R_ID |
|---|---|---|---|---|---|---|---|---|---|---|

# 7. QUERIES IN SQL

**7.1.  GROUP BY:** List how many rental agreements are made by the customers based on the state that issued the driving license.

```
SELECT       C_OpState, Count(*)
FROM         RENTAL_AGREE
GROUP BY     C_OpState;
```

| | C_OPSTATE | COUNT(*) |
|---|---|---|
| 1 | CT | 2 |
| 2 | PA | 2 |
| 3 | MA | 3 |
| 4 | NY | 27 |
| 5 | NJ | 6 |

**Query Result SQL**  [x]

RentACar : SELECT C_OpState, Count(*)
FROM RENTAL_AGREE
GROUP BY C_OpState

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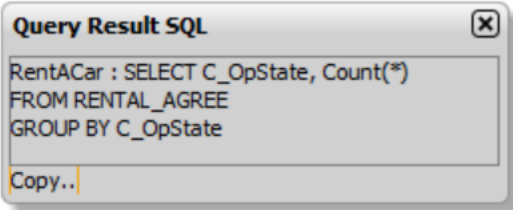
**7.2.  GROUP BY AND HAVING:** List class types and count with at least 5 reservations.

```
SELECT       R_ClassType, Count(*)
FROM         RESERVATION
GROUP BY     R_ClassType
HAVING       Count(*) >= 5;
```

| | R_CLASSTYPE | COUNT(*) |
|---|---|---|
| 1 | Sedan | 6 |
| 2 | SUV | 6 |
| 3 | Luxury | 14 |
| 4 | Electric | 9 |

**Query Result SQL**  [x]

RentACar : SELECT R_ClassType, Count(*)
FROM RESERVATION
GROUP BY R_ClassType
HAVING Count(*) >= 5

Copy..
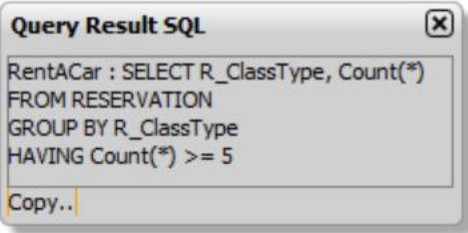
**7.3.  NESTED WITH ALL:** List Contract_ID and Final_Cost of those rental agreements that fetched more money in 2023 compared to all agreements in 2022.

```
SELECT       Contract_ID, Final_Cost
FROM         RENTAL_AGREE
WHERE        Final_Cost > ALL (
```

```
SELECT      Final_Cost
FROM        RENTAL_AGREE
WHERE       RA_CurrentDate >= '2022-01-01' and RA_CurrentDate <= '2022-12-31')
AND         RA_CurrentDate >= '2023-01-01' and RA_CurrentDate <= '2023-12-31';
```

| CONTRACT_ID | FINAL_COST |
|---|---|
| 1 026_031LUX04 | 4791.11 |

**Query Result SQL** ☒

```
RentACar : SELECT Contract_ID, Final_Cost
FROM RENTAL_AGREE
WHERE Final_Cost > ALL (
SELECT Final_Cost
   FROM RENTAL_AGREE
   WHERE RA_CurrentDate >= '2022-01-01' and RA_CurrentDate <= '2022-12-31')
AND RA_CurrentDate >= '2023-01-01' and RA_CurrentDate <= '2023-12-31'
```
Copy..

**7.4.   NESTED WITH IN:** List down the no show reservations, meaning that a customer has made a reservation and didn't pick up the car. Include customer name and address in the report.

```
SELECT      R_ID, C_Name, C_Address
FROM        RESERVATION
WHERE       R_ID NOT IN (
      SELECT      R_ID
      FROM        RENTAL_AGREE RA);
```

| | R_ID | C_NAME | C_ADDRESS |
|---|---|---|---|
| 1 | 045LUX01 | Ruhi Tremblay | 26 Virginia Dr, Astoria, NY 11103 |
| 2 | 007COM03 | Caleigh Starkey | 7876 Durham Rd, New York, NY 10023 |
| 3 | 036VAN02 | Tamera Senn | 309 Logan St, South Ozone Park, NY 11420 |
| 4 | 020HYB03 | Nikko Xu | 904 Summit Rd, Flushing, NY 11355 |
| 5 | 013HYB02 | Tyla Mclaren | 235 Washington Ave, Brentwood, NY 11717 |
| 6 | 028SUV01 | Hans Robins | 80 W. Gainsway St, Brooklyn, NY 11229 |
| 7 | 024MID01 | Xion Wardell | 1 Division Dr, Fresh Meadows, NY 11365 |
| 8 | 032SUV03 | Jarvis Jett | 25 Mechanic Dr, Yonkers, NY 10701 |
| 9 | 050ELE01 | Eleonora Brownfield | 127 East Central Ave, Brooklyn, NY 11219 |
| 10 | 041ELE01 | Starr Rey | 61 Theatre Court, Flushing, NY 11355 |

**Query Result SQL** ☒

```
RentACar : SELECT R_ID, C_Name, C_Address
FROM RESERVATION
WHERE R_ID NOT IN (
SELECT R_ID
   FROM RENTAL_AGREE RA)
```
Copy..

## 8. WEB SYSTEM SCREENSHOTS

In this section, scenarios are described using screenshots from the front end of the application.

Fig 8.1. PhpMyAdmin *Reservation Database* before inserting two new reservations: This snapshot shows the *Reservation Table,* in the current state. It provides us with the options to Edit, Copy and Delete as shown on the left side of the panel.

Fig 8.2. Two new reservation records successfully inserted: Following form shows how the reservations are being submitted when the customer calls the location to book a car.

**Fig 8.3. PhpMyAdmin _Reservation Database_ after inserting two new reservations:** After making the 2 new reservations above, see how the _Reservation Table_ now shows the new entries at the bottom of the screen.

**Fig 8.4. PhpMyAdmin *Rental_Agree Database* before inserting a new contract:** Similar to the *Reservation Table* please find below snapshots showing the state of the *Rental Agreement Table* before signing the contract.

Fig 8.5. PhpMyAdmin *Rental_Agree Database* after inserting a new contract: Snapshots showing how the state of the *Rental Agreement Table* changes after signing the contract.

Fig 8.6. SQL 7.4 result with the no show reservations, including customer name and address: Here, we are doing some analysis on how many customers did not show up and/or did not actually rent a car. Based on the customer information, RentACar company can call the customer to receive some feedback to understand the areas to improve, just in case, there is some reason with respect to the service by company. For any business, it is important to think from the side of the customer.

## CUSTOMER RECORDS (NO SHOW RESERVATIONS)

| RESERVATION ID | CUSTOMER NAME | CUSTOMER ADDRESS |
|---|---|---|
| 007COM03 | Caleigh Starkey | 7876 Durham Rd, New York, NY 10023 |
| 013HYB02 | Tyla Mclaren | 235 Washington Ave, Brentwood, NY 11717 |
| 020HYB03 | Nikko Xu | 904 Summit Rd, Flushing, NY 11355 |
| 024MID01 | Xion Wardell | 1 Division Dr, Fresh Meadows, NY 11365 |
| 028SUV01 | Hans Robins | 80 W. Gainsway St, Brooklyn, NY 11229 |
| 032SUV03 | Jarvis Jett | 25 Mechanic Dr, Yonkers, NY 10701 |
| 036VAN02 | Tamera Senn | 309 Logan St, South Ozone Park, NY 11420 |
| 041ELE01 | Starr Rey | 61 Theatre Court, Flushing, NY 11355 |
| 045LUX01 | Ruhi Tremblay | 26 Virginia Dr, Astoria, NY 11103 |
| 050ELE01 | Eleonora Brownfield | 127 East Central Ave, Brooklyn, NY 11219 |

```php
<?php

$servername = "localhost";
$username = "root";
$password = "";
$dbname = "rent_car_database";

$conn = mysqli_connect($servername, $username, $password, $dbname);

$sqlcheck = "SELECT R_ID, C_Name, C_Address FROM RESERVATION WHERE R_ID NOT IN
$result = mysqli_query($conn, $sqlcheck);
?>

<!DOCTYPE html>
<html lang="en">
    <head>
        <title>NO SHOW RESERVATIONS</title>
    </head>
    <body>
        <table align="center" border="1px" style="width:600px; line-height:40px
            <tr>
                <th colspan="4"><h2> CUSTOMER RECORDS (NO SHOW RESERVATIONS)</h
            </tr>
            <t>
                <th> RESERVATION ID </th>
                <th> CUSTOMER NAME </th>
                <th> CUSTOMER ADDRESS </th>
            </t>
            <?php
                while($rows = mysqli_fetch_assoc($result))
                {
            ?>
                <tr>
                    <td><?php echo $rows['R_ID']; ?></td>
                    <td><?php echo $rows['C_Name']; ?></td>
                    <td><?php echo $rows['C_Address']; ?></td>
                </tr>
            <?php
                }
            ?>
        </table>
    </body>
</html>
```

Show desktop

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# 9. CONCLUSION

This has been a very good experience working as a team. It demanded collaboration and subsequently developed friendship, puts us always in constant consciousness to support each other and not let the team down. We hope this is the most important aspect for the long run of our careers.

Understanding the business requirement was fundamental for the entire project, we would not say that this is the most difficult part, however for this we had brainstormed quite a bit. Initially, we came up individually with multiple ways of arriving at the ER Model, for the same given requirement. We debated around on what could essentially form the entity, what forms the attributes and the relationship. Finally agreed on something, then sought help from the Professor during the office hours to get an opinion. In fact, it was very helpful and increased our confidence quite a lot.

RentACar Project had a good amount of scope to think through the requirements thoroughly, covering every aspect starting from the customer calling the location to book a car, till the time, car is returned to the facility.

Once the ER model has been successfully constructed, we would say that the rest of the subsequent steps in developing the database model, had actually fallen in place by itself.

The one last thing that was difficult was the front-end part as the course pretty much covered aspects of the database.

Another most important thing was the data. A good amount of time was spent to put the data together.

If we have to start this all over again, we will focus on having this product tested thoroughly to cover every aspect of the operations required for the car rental app. Simply put, to level of selling the product.

Last but not the least, Thank you very much Professor for all your guidance. We personally feel that the course covered a lot of essentials, and especially the way, it is taught through is beyond our words. Once again, Thank you, Professor.