**PART 1**

**Executive Summary**  
Designing a database for the nurses working at Green Apple Healthcare, which would contain information about their shifts, department assignments and pay slip. The purpose of making such a database is to make good use of the hospital’s new enterprise system and improve the overall efficiency of managing the nurses’ roster.  
  
**Business Rules**

1. Each nurse has first name, last name, employ ID, phone number and address.
2. Nurses will be assigned a shift, patients and a department only after they have completed a 2-month mandatory training period.
3. One shift has atleast one nurse working in it.
4. One nurse can do zero or multiple shifts.
5. Each shift comprises of a shift code, day and timeslot.
6. Each nurse can work in only 1 timeslot per day.
7. Each nurse’s shift will be changed after 1 week.
8. One department has atleast one nurse working in it.
9. One nurse can work in zero or one department.
10. Each department will be headed by one doctor.
11. Each Doctor will be the head of a department.
12. Each Doctor should have first name, last name, employ ID, phone number and address.
13. Each department must have a name, department number and location within the hospital.
14. Each nurse’s department will be changed after every 2 weeks.
15. Nurses cannot exchange shifts with other nurses without the Hospital’s permission.
16. Nurses cannot exchange departments with other nurses without the Hospital’s permission
17. One nurse can look after zero or multiple patients.
18. Each patient will be looked after by atleast 1 nurse.
19. Each patient will have a Patient ID, name, date admitted, room number.
20. No two patients can have the same ID or room number
21. In case of overtime, pay rate for nurses will be one and one-half (1.5) times their regular working hour rate of pay.
22. Every nurse will get a payslip on the 10th of each month.
23. Every payslip must have a payslip number, salary deposit date, bonus awarded, salary deposited and bank account number.

**ERD Components  
Entity 1:** Nurses  
**Attributes:** N\_EmployID, N\_FirstName, N\_LastName, N\_PhoneNum, N\_Address

**Entity 2:** Shift  
**Attributes:** ShiftCode, Timeslot, Days

**Entity 3:** Department  
**Attributes:** Dept\_Number, Dept\_Name, Dept\_Location

**Entity 4:** Patient  
**Attributes:** P\_ID, P\_FullName, P\_DateAdmitted, P\_RoomNumber

**Entity 5:** Payslip  
**Attributes:** PayslipNumber, SalaryDepositDate, BonusAwarded, SalaryDeposited, BankAccountNumber

**Entity 6:** Doctor  
**Attributes:** D\_EmployID, D\_FirstName, D\_LastName, D\_PhoneNum, D\_Address

**Entity 7:** Nurses\_Shift (Intermediary table created to break many to many relationship between Nurses and Shift)   
**Attributes:** N\_EmployID, ShiftCode

**Entity 8:** Nurses\_Patients (Intermediary table created to break many to many relationship between Nurses and Patients)   
**Attributes:** N\_EmployID, P\_ID

**Relationships**

1. One shift has atleast one nurse working in it and one nurse can do zero or multiple shifts.
2. One department has atleast one nurse working in it and one nurse can work in zero or one department.
3. One nurse can look after zero or multiple patients and one patient will be looked after by atleast one nurse.
4. One nurse will get one payslip and one payslip is generated for one nurse.
5. One department is headed by one doctor and one doctor can only head one department.

**Cardinality**

1. Nurses (0:M) – Shift (1:N) -> Nurses (0:M) – Nurses\_Shift (1:1) and Nurses\_Shift (1:1) – Shift (1:N)
2. Nurses (0:1) – Department (1:N)
3. Nurses (0:M) – Patient (1:N) -> Nurses (0:M) – Nurses\_Patients (1:1) and Nurses\_Patients (1:1) – Patient (1:N)
4. Nurses (1:1) – Payslip (1:1)
5. Department (1:1) – Doctor (1:1)

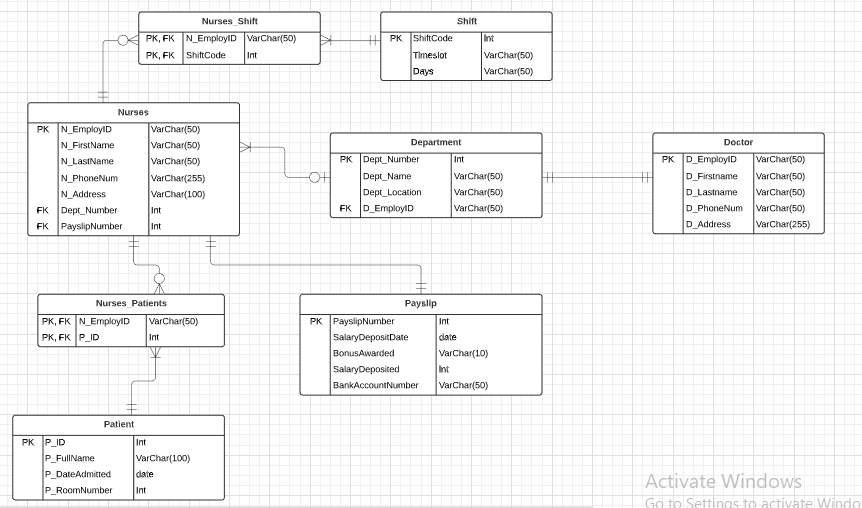
**Keys**

**Nurses:** N\_EmployID (PK), Dept\_Number (FK), PayslipNumber (FK)  
**Shift:** ShiftCode (PK)  
**Department:** Dept\_Number (PK), D\_EmployID (FK)  
**Patient:** P\_ID (PK)  
**Payslip:** PayslipNumber (PK)  
**Doctor:** D\_EmployID (PK)  
**Nurses\_Shift**: N\_EmployID and ShiftCode (Composite Primary Key). Both individually are also foreign keys.  
**Nurses\_Patients:** N\_EmployID and P\_ID (Composite Primary Key). Both individually are also foreign keys.

**Two Dimensional Flat File**

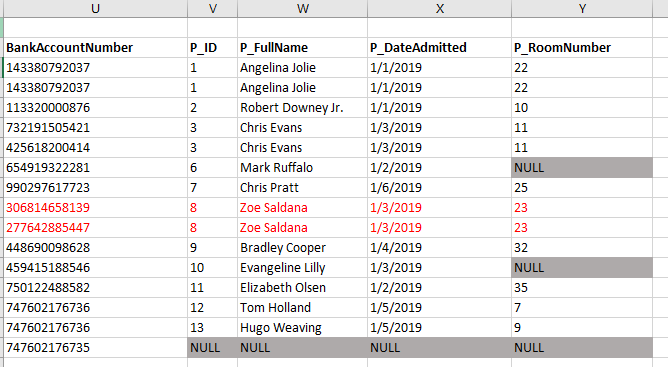
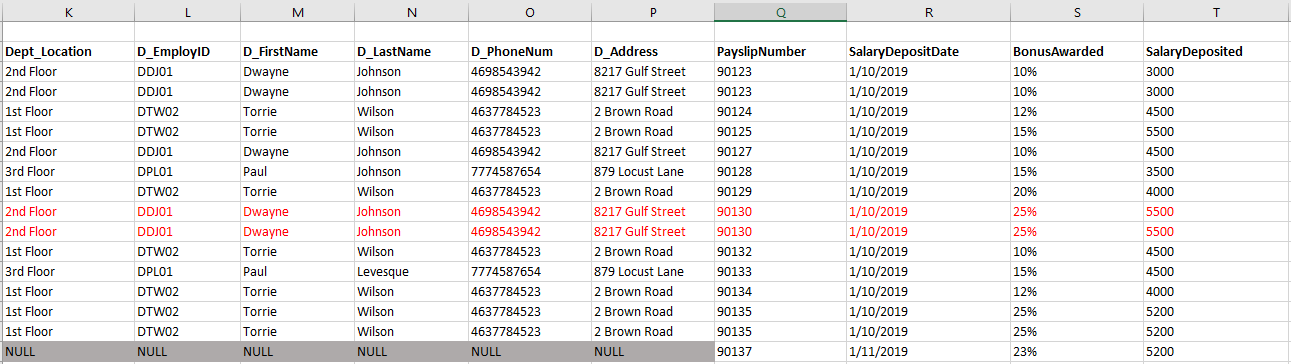
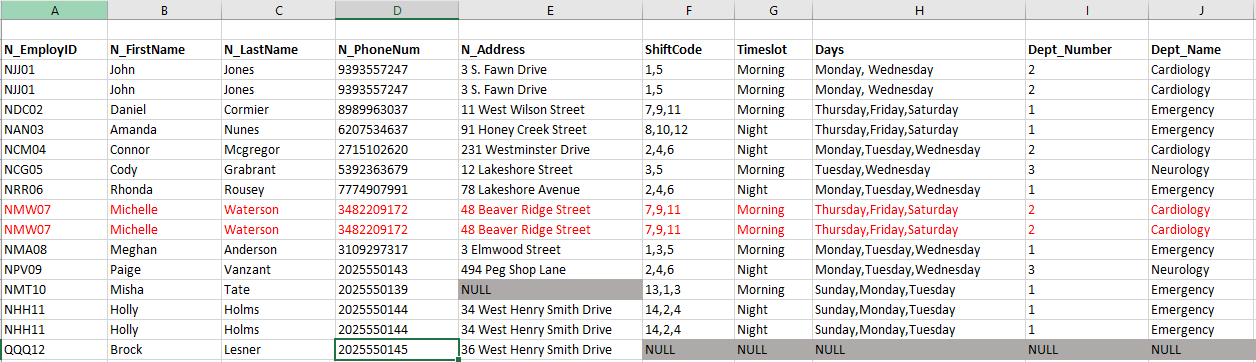


**ERD Diagram**



**PART 2**

**UNF Table**



**Dependencies**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **N\_EmployID** | **N\_FirstName** | **N\_LastName** | **N\_PhoneNum** | **N\_Address** |

|  |  |  |
| --- | --- | --- |
| **ShiftCode** | **Timeslot** | **Days** |

|  |  |  |  |
| --- | --- | --- | --- |
| **Dept\_Number** | **Dept\_Name** | **Dept\_Location** | **HOD\_Name** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **D\_EmployID** | **D\_FirstName** | **D\_LastName** | **D\_PhoneNum** | **D\_Address** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **PayslipNumber** | **SalaryDepositDate** | **BonusAwarded** | **SalaryDeposited** | **BankAccountNumber** |

|  |  |  |  |
| --- | --- | --- | --- |
| **P\_ID** | **P\_FullName** | **P\_DateAdmitted** | **P\_RoomNumber** |

**Primary Keys:** N\_EmployID, ShiftCode, Dept\_Number, D\_EmployID, PayslipNumber, P\_ID

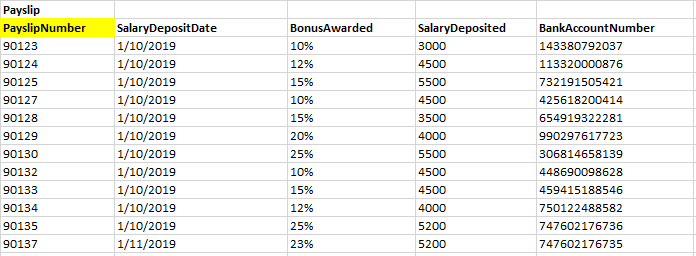
**Tables Separated Below**













Since there are no transitive dependencies, above tables satisfy 3NF condition.

**Foreign Keys**



PayslipNumber and Dept\_Number are foreign keys in Nurses table



D\_EmployID is foreign key in Department table

Below tables were made in order to break the many to many relationship between Nurses and Patient (Nurses\_Patient), Nurses and Shift (Nurses\_Shift)

**Nurses\_Shift**: N\_EmployID and ShiftCode (Composite Primary Key). Both individually are also foreign keys.  
**Nurses\_Patients:** N\_EmployID and P\_ID (Composite Primary Key). Both individually are also foreign keys.

Relationships and cardinalities already the same as in in Part 1.

**PART 3 (Script)**

**Creating database and tables**

create database Nurses\_DB

use Nurses\_DB;

create table Nurses\_DB.Nurses\_OP.Doctor (

D\_EmployID VARCHAR (50) PRIMARY KEY,

D\_FirstName VARCHAR (50) NOT NULL,

D\_LastName VARCHAR (50) NOT NULL,

D\_PhoneNum VARCHAR (50) NOT NULL,

D\_Address VARCHAR (255) NOT NULL

);

create table Nurses\_DB.Nurses\_OP.Patient (

P\_ID INT PRIMARY KEY IDENTITY (1, 1),

P\_FullName VARCHAR (100) NOT NULL,

P\_DateAdmitted DATE NOT NULL,

P\_RoomNumber INT NULL

);

create table Nurses\_DB.Nurses\_OP.Payslip (

PayslipNumber INT PRIMARY KEY,

SalaryDepositDate DATE NOT NULL,

BonusAwarded VARCHAR(10) NOT NULL,

SalaryDeposited INT NOT NULL,

BankAccountNumber VARCHAR(50) NOT NULL

);

create table Nurses\_DB.Nurses\_OP.Department (

Dept\_Number INT PRIMARY KEY IDENTITY (1, 1),

Dept\_Name VARCHAR (50) NOT NULL,

Dept\_Location VARCHAR (50) NOT NULL,

D\_EmployID VARCHAR (50) NOT NULL,

FOREIGN KEY (D\_EmployID) REFERENCES Nurses\_DB.Nurses\_OP.Doctor (D\_EmployID)

);

alter table Nurses\_DB.Nurses\_OP.Nurses

alter column Dept\_Number INT NULL;

create table Nurses\_DB.Nurses\_OP.Nurses (

N\_EmployID VARCHAR (50) PRIMARY KEY,

N\_FirstName VARCHAR (50) NOT NULL,

N\_LastName VARCHAR (50) NOT NULL,

N\_PhoneNum VARCHAR (255),

N\_Address VARCHAR (100) NULL,

Dept\_Number INT NOT NULL,

PayslipNumber INT NOT NULL,

FOREIGN KEY (Dept\_Number) REFERENCES Nurses\_DB.Nurses\_OP.Department (Dept\_Number),

FOREIGN KEY (PayslipNumber) REFERENCES Nurses\_DB.Nurses\_OP.Payslip (PayslipNumber)

);

create table Nurses\_DB.Nurses\_OP.Shifts (

ShiftCode INT PRIMARY KEY IDENTITY (1, 1),

Timeslot VARCHAR (50) NOT NULL,

Days VARCHAR (50) NOT NULL

);

create table Nurses\_DB.Nurses\_OP.Nurses\_Shift (

N\_employID VARCHAR (50) NOT NULL,

ShiftCode INT NOT NULL,

PRIMARY KEY (N\_employID,ShiftCode),

FOREIGN KEY (N\_employID) REFERENCES Nurses\_DB.Nurses\_OP.Nurses (N\_EmployID),

FOREIGN KEY (ShiftCode) REFERENCES Nurses\_DB.Nurses\_OP.Shifts (ShiftCode),

);

create table Nurses\_DB.Nurses\_OP.Nurses\_Patients (

N\_employID VARCHAR (50) NOT NULL,

P\_ID INT,

PRIMARY KEY (N\_employID,P\_ID),

FOREIGN KEY (N\_employID) REFERENCES Nurses\_DB.Nurses\_OP.Nurses (N\_EmployID),

FOREIGN KEY (P\_ID) REFERENCES Nurses\_DB.Nurses\_OP.Patient (P\_ID)

);

**Adding data in tables**

INSERT INTO Nurses\_DB.Nurses\_OP.Doctor (D\_EmployID,D\_FirstName,D\_LastName,D\_PhoneNum,D\_Address)

values ('DDJ01','Dwayne','Johnson' ,'4698543942' ,'8217 Gulf Street'), ('DPL01', 'Paul', 'Johnson', '7774587654', '879 Locust Lane'),

('DTW02', 'Torrie', 'Wilson', '4637784523', '2 Brown Road');

insert into Nurses\_DB.Nurses\_OP.Patient (P\_FullName, P\_DateAdmitted, P\_RoomNumber)

values ('Angelina Jolie', '1/1/2019', 22);

insert into Nurses\_DB.Nurses\_OP.Patient (P\_FullName, P\_DateAdmitted, P\_RoomNumber)

values ('Robert Downey Jr.','1/1/2019',10

),('Chris Evans','1/3/2019',11

),('Mark Ruffalo','1/2/2019',NULL

),('Chris Pratt','1/6/2019',25

),('Zoe Saldana','1/3/2019',23

),('Bradley Cooper ','1/4/2019',32

),('Evangeline Lilly','1/3/2019',NULL

),('Elizabeth Olsen','1/2/2019',35

),('Tom Holland','1/5/2019',7

),('Hugo Weaving','1/5/2019',9

);

insert into Nurses\_DB.Nurses\_OP.Payslip (PayslipNumber, SalaryDepositDate, BonusAwarded, SalaryDeposited, BankAccountNumber)

values (90123,'1/10/2019','10%',3000,'143380792037'

),(90124,'1/10/2019','12%',4500,'113320000876'

),(90125,'1/10/2019','15%',5500,'732191505421'

),(90127,'1/10/2019','10%',4500,'425618200414'

),(90128,'1/10/2019','15%',3500,'654919322281'

),(90129,'1/10/2019','20%',4000,'990297617723'

),(90130,'1/10/2019','25%',5500,'306814658139'

),(90132,'1/10/2019','10%',4500,'448690098628'

),(90133,'1/10/2019','15%',4500,'459415188546'

),(90134,'1/10/2019','12%',4000,'750122488582'

),(90135,'1/10/2019','25%',5200,'747602176736'

);

insert into Nurses\_DB.Nurses\_OP.Payslip (PayslipNumber, SalaryDepositDate, BonusAwarded, SalaryDeposited, BankAccountNumber)

values (90137,'1/11/2019','23%',5200,'747602176735'

)

insert into Nurses\_DB.Nurses\_OP.Department (Dept\_Name, Dept\_Location, D\_EmployID)

values ('Emergency','1st Floor','DTW02'

),('Cardiology','2nd Floor','DDJ01'

),('Neurology','3rd Floor','DPL01'

);

insert into Nurses\_DB.Nurses\_OP.Nurses (N\_EmployID, N\_FirstName, N\_LastName, N\_PhoneNum, N\_Address, Dept\_Number, PayslipNumber)

values ('NJJ01','John','Jones','9393557247','3 S. Fawn Drive',2,90123),

('NDC02','Daniel','Cormier','8989963037','11 West Wilson Street',1,90124),

('NAN03','Amanda','Nunes ','6207534637','91 Honey Creek Street',1,90125

),

('NCM04','Connor','Mcgregor','2715102620','231 Westminster Drive',2,90127

),

('NCG05','Cody','Grabrant','5392363679','12 Lakeshore Street',3,90128

),

('NRR06','Rhonda','Rousey','7774907991','78 Lakeshore Avenue',1,90129

),

('NMW07','Michelle','Waterson','3482209172','48 Beaver Ridge Street',2,90130

),

('NMA08','Meghan','Anderson','3109297317','3 Elmwood Street',1,90132

),

('NPV09','Paige','Vanzant','2025550143','494 Peg Shop Lane',3,90133

),

('NMT10','Misha ','Tate','2025550139',NULL,1,90134

),

('NHH11','Holly','Holms','2025550144','34 West Henry Smith Drive',1,90135

);

insert into Nurses\_DB.Nurses\_OP.Nurses (N\_EmployID, N\_FirstName, N\_LastName, N\_PhoneNum, N\_Address, Dept\_Number, PayslipNumber)

values ('QQQ12', 'Brock', 'Lesner', '2025550145', '36 West Henry Smith Drive', NULL, 90137);

insert into Nurses\_DB.Nurses\_OP.Shifts (Timeslot, Days)

values ('Morning','Monday

'),('Night','Monday

'),('Morning','Tuesday

'),('Night','Tuesday

'),('Morning','Wednesday

'),('Night','Wednesday

'),('Morning','Thursday

'),('Night','Thursday

'),('Morning','Friday

'),('Night','Friday

'),('Morning','Saturday

'),('Night','Saturday

'),('Morning','Sunday

'),('Night','Sunday

');

insert into Nurses\_DB.Nurses\_OP.Nurses\_Shift (N\_employID, ShiftCode)

values ('NJJ01',1

),('NJJ01',5

),('NDC02',7

),('NDC02',9

),('NDC02',11

),('NAN03',8

),('NAN03',10

),('NAN03',12

),('NCM04',2

),('NCM04',4

),('NCM04',6

),('NCG05',3

),('NCG05',5

),('NRR06',2

),('NRR06',4

),('NRR06',6

),('NMW07',7

),('NMW07',9

),('NMW07',11

),('NMA08',1

),('NMA08',3

),('NMA08',5

),('NPV09',2

),('NPV09',4

),('NPV09',6

),('NMT10',13

),('NMT10',1

),('NMT10',3

),('NHH11',14

),('NHH11',2

),('NHH11',4

);

insert into Nurses\_DB.Nurses\_OP.Nurses\_Patients (N\_employID,P\_ID)

values ('NDC02',5

),('NAN03',6

),('NCM04',6

),('NCG05',7

),('NRR06',8

),('NMW07',9

),('NMA08',10

),('NPV09',11

),('NMT10',12

),('NHH11',13

),('NHH11',14

);

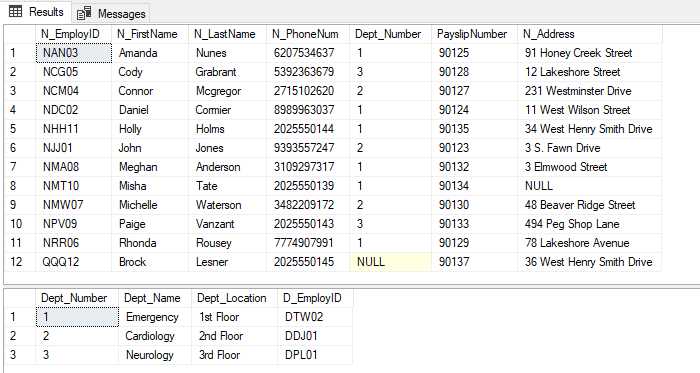
**Testing Joins and their results**

-- I chose Nurses and Departments

-- a. Show your table records

select \* from Nurses\_DB.Nurses\_OP.Nurses;

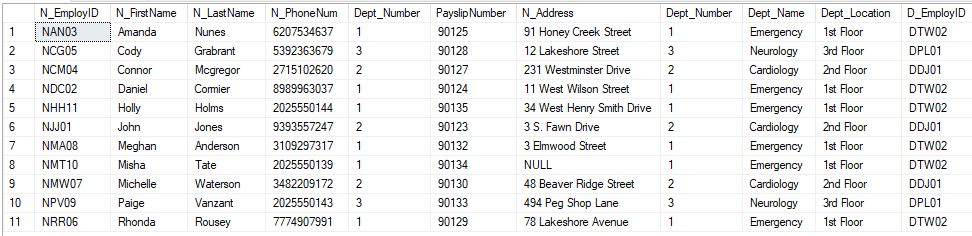
select \* from Nurses\_DB.Nurses\_OP.Department;



-- b. Create inner joins between two tables

select \* from Nurses\_DB.Nurses\_OP.Nurses A

inner join Nurses\_DB.Nurses\_OP.Department B on A.Dept\_Number = B.Dept\_Number;

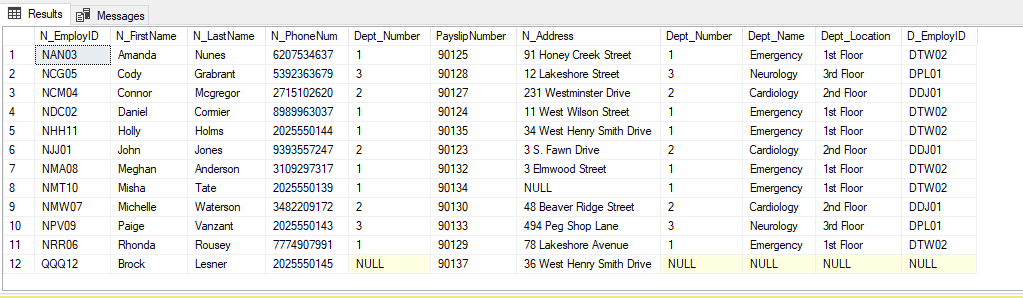


All nurses except Brock Lesner (N\_EmployID=QQQ12) are shown here, since Brock did not have any Dept\_Number

-- c. Create full joins between two tables

select \* from Nurses\_DB.Nurses\_OP.Nurses A

full outer join Nurses\_DB.Nurses\_OP.Department B on A.Dept\_Number = B.Dept\_Number;

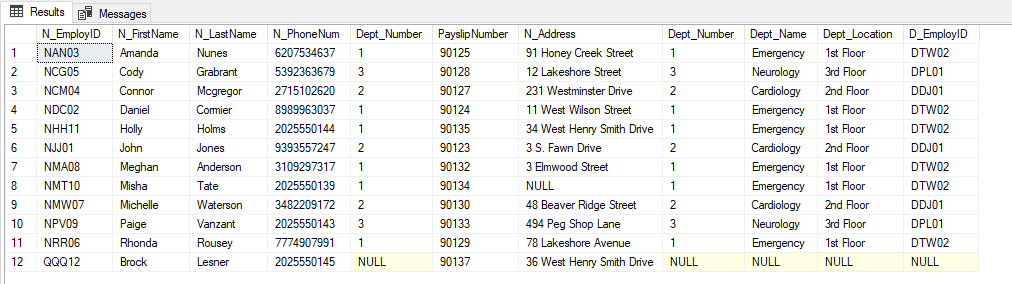


Shows all the nurses and all departments.

-- d. Create left outer joins between two tables

select \* from Nurses\_DB.Nurses\_OP.Nurses A

left outer join Nurses\_DB.Nurses\_OP.Department B on A.Dept\_Number = B.Dept\_Number;

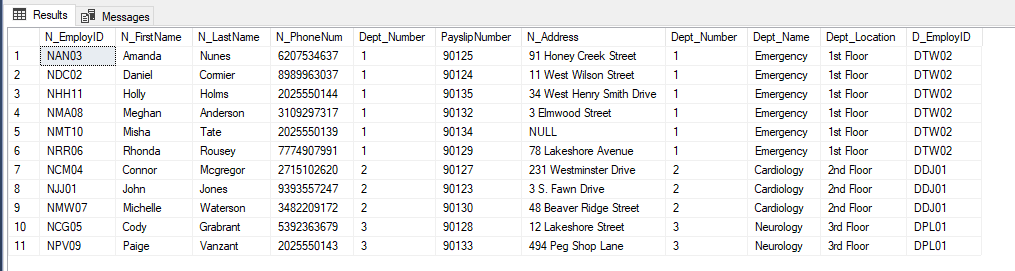


Using left outer join, the record unique to the left table is also shown. The last record of the Nurses table (12th record) with NULLs in the Department table against it.

-- e. Create right outer joins between two tables

select \* from Nurses\_DB.Nurses\_OP.Nurses A

right outer join Nurses\_DB.Nurses\_OP.Department B on A.Dept\_Number = B.Dept\_Number;



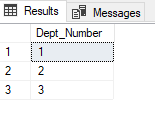
Since there is no department that has no nurses, right join would give the same result as inner join and return us 11 records. All the records in the right hand table match the records in the left hand table.

-- f. Create intersect between two tables

select Dept\_Number from Nurses\_DB.Nurses\_OP.Nurses

intersect

select Dept\_Number from Nurses\_DB.Nurses\_OP.Department;



Intersection of dept number of both nurses and department table is shown.

-- g. Create union between two tables

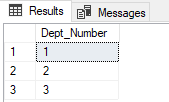
select Dept\_Number from Nurses\_DB.Nurses\_OP.Nurses

where Dept\_Number in (1,2)

union

select Dept\_Number from Nurses\_DB.Nurses\_OP.Department

where Dept\_Number in (3);



The first query fetches department 1 and 2 and the second query fetches department 3. Union joins both the results and shows us all the 3 departments.

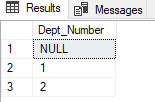
--h. Create except between two tables

select Dept\_Number from Nurses\_DB.Nurses\_OP.Nurses

except

select Dept\_Number from Nurses\_DB.Nurses\_OP.Department

where Dept\_Number in (3);



For except, the first query returns all three departments (1,2 and 3). The second query only returns department 3. Since except would remove the records from the first query that are in second query, we only see department 1 and 2 in the result.