VIT®

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

J Component report

On

Database Design and Implementation

TOPIC: COVID DATABASE

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1. Problem Statement

Covid-19 has widely spread in the world and making it difficult to manage database for all the required things to counter this pandemic.

For this, the database should contain the hospital details which are covid specialized, doctors who can cure the covid patients, and the functionality such that the person can be differentiated as a patient or a beneficiary so that the beneficiaries can be vaccinated easily without any confusion between them. It should also have the details for the vaccination center, the vaccinator working in the vaccination center to vaccinate the beneficiary, and the vaccine to know which vaccine a beneficiary has taken. It should also get the details of cases from the hospital and use alert in zone likewise.

For a person, the attributes should contain the Aadhar number, name, gender, date of birth, and the address of the person which contains the city, street, and state details. Whereas the beneficiary will have the attributes like beneficiary id and the number of doses taken by the beneficiary.

The vaccinator will have its vaccinator id, name, age, and gender as attributes. Center id, center name, available doses, and the duration of opening time and closing time these attributes should be present in the vaccination center. For vaccines, the details like vaccine name, the time gap between doses if exist, maintained temperature for the vaccine, the name of the country in which the vaccine was made in, number of doses required for the vaccine, and the side effects for the vaccine should be added as an attribute.

The cases will contain the name of the place, reported date, cure rate, death rate, CFR, number of cases, and the zone contains the place, alert, and pin code as attributes respectively.

The attributes for a patient can have patient id, admitted date of the patient, find whether the patient is home quarantine, and the bed number of the patient if he/she is admitted in the hospital. The doctor should have their name, Doctor's id, age, gender, and his/her experience.

For the hospital, the attributes should be Hospital id, hospital name, number of beds available in the hospital, multiple phone numbers for the hospital, and the address of the hospital which contains branch and city of the hospital.

The person can be any of both patient or beneficiary or died, the patients should be under a doctor specialization only to become a cure, the hospital has more than one doctors working in it whereas for beneficiaries, they should be vaccinated by vaccinator, were the vaccinator's works in vaccination center and these vaccination centers get vaccines supplied to theirs.

2. Module 1: Analysis

Identify the following

Entity (Strong /weak):

Strong:

Person

Patient

Beneficiary
Doctor
Hospital
Cases
Zone
Vaccinator
VaccinationCenter
Vaccine

Different types of attributes:

Patient:
PatientID
BedNumber
HomeQuarantine
AdmittedDate
AadharNumber
Name
DateOfBirth
City
Street
State
DoctorID

Doctor:
DoctorID
Name
Age
Gender
Experience
HospitalID

Hospital:
HospitalID
HospitalName
Branch
BedsAvailable
ReportedDate
Place

Hospital_City:
Branch
City

HospitalPhoneNumber:
PhoneNumber
HospitalID

Cases:

ReportedDate
Place
NumberOfCases
CuredRate
DeathRate
CFR
Alert
ZPlace

Zone:
Alert
Place
Pincode

Beneficiary:
BenificiaryID
NumberOfDosesTaken
AadharNumber
Name
DateOfBirth
City
Street
State
VaccinatorID

Vaccinator:
VaccinatorID
Name
Age
Gender
CenterID

VaccinationCenter:
CenterID
Name
OpensAt
ClosesAt
AvailableVaccines
VaccineName

Vaccine:
VaccineName
MadeIn
MaintainedTemperature
DosesRequired
TimeGap

Vaccine_Sideeffects:

SideEffects
VaccineName

Relationship:

Patient : Doctor – Cure
Doctor : Hospital – has
Hospital : Cases – report
Cases : Zone – basedon
Beneficiary : Vaccinator–Vaccinatedby
Vaccinator: VaccinationCenter-worksat
VaccinationCenter : Vaccine - Supplied

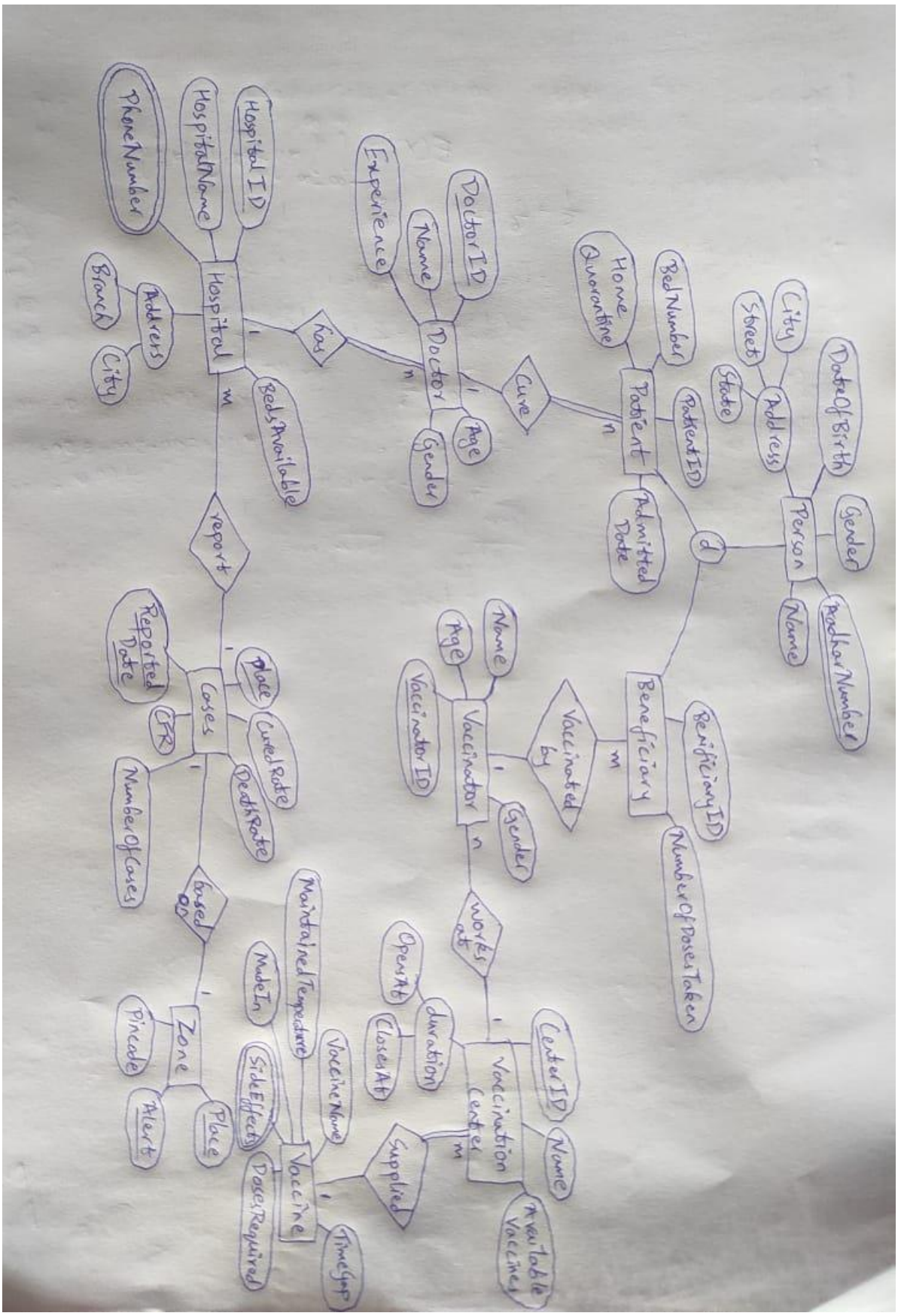
Cardinality:

Patient : Doctor – n:1
Doctor : Hospital – n:1
Hospital : Cases – m:1
Cases : Zone – 1:1
Beneficiary : Vaccinator – m:1
Vaccinator: VaccinationCenter – n:1
VaccinationCenter : Vaccine – m:1

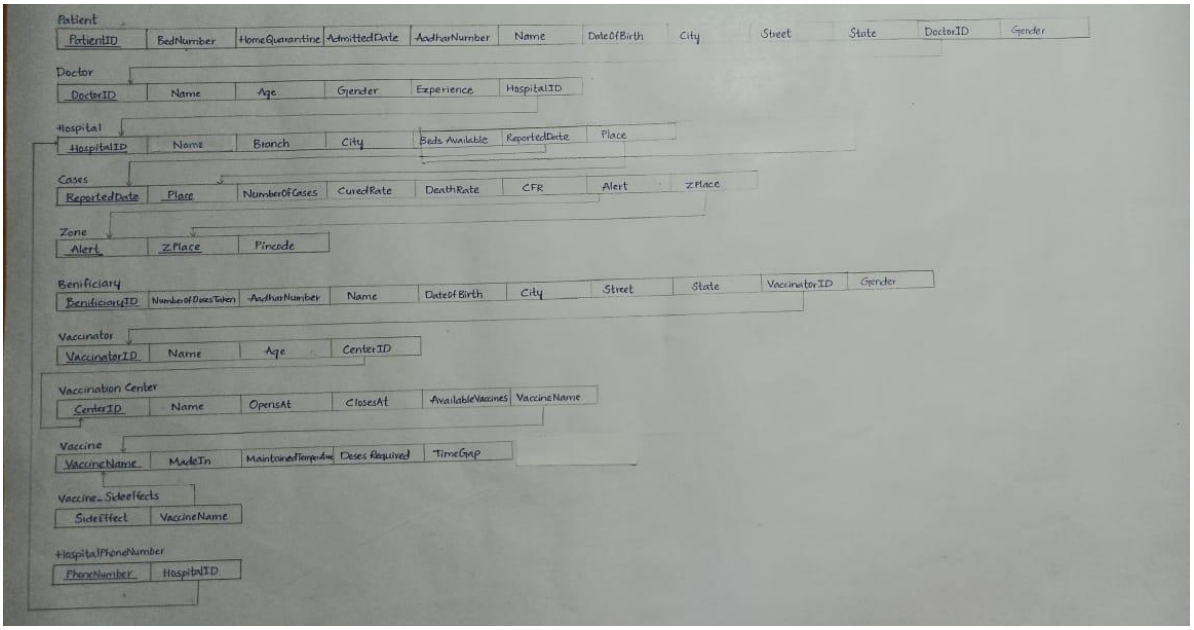
Participation:

Patient : Doctor – total : partial
Doctor : Hospital – total : partial
Hospital : Cases – partial : partial
Cases : Zone – partial : partial
Beneficiary : Vaccinator – partial : partial
Vaccinator : VaccinationCenter – partial: partial
VaccinationCenter : Vaccine – total : partial

3. Module 2: Design



4. Module 3: Mapping



5. Module 4: Normalization

Vaccinator:

VaccinatorID	Name	Age	Gender	CenterID
678398	Arjunsingh	29	Male	POWG22
716279	Rodeshgupta	34	Male	UKI744
823641	Arjunsingh	34	Male	UKI741
797512	MounikaM	43	Female	HYT752
782479	AditiChopra	43	Female	LKS657

Here the FD will be VaccinatorID → Name, Age, Gender, CenterID.

First Normal Form (1NF): single / simple & atomic

All the attributes in Vaccinator are atomic, because it is taken care in design phase, where all the multi value attributes are mapped into single valued attribute during ER-table conversion. Hence, it is 1NF.

Second Normal Form(2NF): - should be 1NF, no PFD

It is 1NF and it doesn't have composite key, so no PFD.

Hence, it is 2NF

Third Normal Form(3NF): - should be 2NF, no TFD

It is 2NF and no TFD are present in this Relation.

Hence, it is 3NF ∴ Hence, it is Normalized.

Vaccine_Sideeffects:

SideEffect	VaccineName
Headache	Covaxin
Fever	Covaxin
Tiredness	Covidshield
Muscle pain	Pfizer
Nausea	Johnson & Johnson

Here the only FD is SideEffect → VaccineName

First Normal Form(1NF): single / simple & atomic

As they are no multi valued attributes it is 1NF.

Hence, it is 1NF

Second Normal Form(2NF): - should be 1NF, no PFD

It is 1NF and it doesn't have composite key. Hence, it is 2NF.

Third Normal Form (3NF): - should be 2NF, no TFD
It is 2NF and no TFD are present in this relation.
Hence, it is 3NF.
∴ Hence, it is Normalized.

Patients:

Pid	bno	Ra	ad	andh	n	dob	c	str	st	did
HWTXUIIL7893	296	no	22-03-2019	456789321065	Varun Patel	19-01-1980	Mumbai	colaba	Maharashtra	739272
POPFVARTO971	null	yes	null	892349723917	Ishan Gupta	19-01-1980	Hyderabad	Colaba	Telangana	688787
ISIGKDSV8362	296	no	20-09-2020	745637465420	Varun Patel	20-02-1981	Lucknow	Hazratgaj	Uttarpradesh	688787
JUTLIKYF9023	101	no	22-03-2019	248201020202	Kashit Lio	30-08-1999	Mumbai	Bandstand	Maharashtra	291471
UWGHIASH8724	null	yes	null	357632739819	Priya Uttari	20-02-1981	Chennai	Marivalan	Tamilnadu	739272

~~Here the FD is c -> str~~

1NF: Single / simple & composite
Patient relation doesn't contain any multivalued attributes.
Hence, it is 1NF

2NF: - ~~1NF~~ should be 1NF, no PFD
It is 1NF and it doesn't have composite key.
Hence, it is 2NF

3NF: - should be 2NF, no TFD
It is 2NF and no TFD are present in this relation.
Hence, it is 3NF.
∴ Hence, the final relation is Patient itself.

HospitalPhoneNumber:

PhoneNumber	HospitalID
9385250283	186241
6623563562	835621
9035825297	835621
824617410	186241
7937592411	567856

Here the only FD is PhoneNumber → HospitalID

1NF: Single/simple & atomic

All the attributes in Relation are atomic.

Hence, it is 1NF.

2NF: - should be 1NF, no PFD

The Relation doesn't contain composite key and it is 1NF.

∴ Hence, it is 2NF.

3NF: - should be 2NF, no TFD

It is 2NF and no TFD are present in this relation.

Hence, it is 3NF.

∴ Hence the final relation is R(PhoneNumber, HospitalID)

Zone:

Alert	Place	Pincode
Red	Mumbai	400004
Green	Jodhpur	112001
Orange	Hyderabad	500021
Red	Chennai	600012
Green	Bengaluru	403108

1NF: Single / simple & atomic

No multivalued attribute. Hence, it is 1NF

2NF: - should be 1NF, no PFD

It is 1NF and no PFD are present. Hence, it is 2NF

3NF: - should be 2NF, no TFD

It is 2NF and no TFD are present. Hence, it is 3NF

∴ Hence the final relation is R(Alert, Place, Pincode)

Cases:

ReportedDate	Place	NumberOfCases	CuredRate	DeathRate	CFR	Alert
20-04-2019	Mumbai	2300	97	0.04	10	Red
30-09-2019	Hyderabad	1200	93.7	0.26	0.58	Orange
20-04-2019	Chennai	2300	73	2.17	2.6	Red
30-01-2020	Bengaluru	250	97	0.26	1.35	Green
12-06-2021	Mumbai	4900	98	2.06	10	Red

2Place
Mumbai
Hyderabad
Chennai
Bengaluru
Mumbai

1NF: Single/simple & atomic
No multivalued attributes are present. Hence, it is 1NF

2NF: -should be 1NF, no PFD
It is 1NF and no PFD can be formed in relation.
Hence, it is 2NF

3NF: -should be 2NF, no TFD
It is 2NF and no TFD can be formed in relation.
Hence, it is 3NF

∴ The final relation is Cases itself.

Hospital:

hid	name	b	c	bavai	Rdate	p
940124	Lotus	Borivali	Mumbai	104	12-06-2021	Mumbai
186241	Appolo	Tharagupet	Bengaluru	104	30-09-2020	~~Hyderabad~~ Bengaluru
835621	Lotus	Jubilee Hills	Hyderabad	231	30-09-2019	Hyderabad
567856	Sen	Perambur	Chennai	90	20-04-2019	Chennai
456781	Kamineni	Secunderabad	Hyderabad	111	30-09-2019	Hyderabad

It will have FD as ~~c~~ b → c.

1NF: Single/simple & atomic
No multi valued attributes are present. Hence, it is 1NF.

2NF: -should be 1NF, no PFD
It is 1NF and doesn't contain Composite key hence no PFD.
Hence, it is 2NF.

3NF: -should be 2NF, no TFD
It is 2NF and TFD is b → c

R(hid, name, b, c, bavai, Rdate, p)

R1(b, c) R2(hid, name, b, bavai, Rdate, p).

∴ O/p is R_1 & R_2.

Hence, it is 3NF now.

∴ The final relations are

$R_1(C_b, C)$ & R_2(Chid, name, C_b, bavai, Rdate, P).

Beneficiary:

B.Id	No Of Doses	aadhar no	Name	DOB	city	Street	State	Vaccinator id
624671246191	2	037569557381	09-09-1990	Jatin Sharma	ooty	Kokkal	TN	823641
624671246191	null	012345678910	16-03-2001	Disha Devi	Jaipur	Jotwari	Rajasthan	678398
635862828365	2	1112131415 16	16-03-2001	Disha Devi	Jaipur	Jotwari	Rajasthan	823641
835782367580	null	171819202122	04-09-2001	Hrithik Mehta	Indore	chappan bazar	Telangana	716792
576878769875	1	232425262728	03-08-2002	Hrithik Mehta	Hydarabad	Obrangzeb	MP	823641

Beneficiary:

Here the functional dependency is

city → street

1NF:

Single/Simple & composite

Beneficiary doesn't have multivalued attributes.

Hence it is 1NF

2NF: should be in 1NF, no partial FD

It is in 1NF and it doesn't have composite key. Hence it is in 2NF.

3NF: Here it is in 2NF but it has no TFD. Hence it is in 3NF

Doctor:

Doctor id	Name	Age	Gender	Exparience	Hospital id
881471	Hari OM	27	Male	10	185427
688787	Sita Roy	34	Female	12	456781
727821	Sita Roy	23	Female	12	186241
739272	Ram babu	34	Male	13	940124
876472	Ram babu	37	Male	13	491042

Doctor:

Here the functional dependancy will be:

Doctor id no: → Name, age, gender, Experience, Hospital id.

1NF:

It contains no multivalued attributes/composite attributes, and also it has only the atomic values.

So it is in 1NF.

2NF: It is in 1NF and every non key attribute is dependent on one primary key and it doesn't have any composite key. Hence it is in 2NF.

3NF:

It is in 2NF and no Transitive dependency

Hence this relation is in 3NF.

Vaccine:

Vaccinename	MadeIn	Maintained temp.	Doses Req.	Timegap interval
Covaxin	India	2	2	30 00:00:00
covishield	India	2	2	30 00:00:00
ZyCOV-D	India	8	3	28:00:00:00
PFIZer	US	-15	2	21 00:00:00
Johnson & Johnson	Netherlands	9	1	Null

Vaccine:

The functional dependancy for Vaccine

Vaccine name → Made in, Maintained temp;
Doses Reqr; Timegap, Side effects.

1NF: It has no multivalued / composite attributes and also it has only the atomic values. So it is in 1NF.

2NF: It is in 1NF and every non key attribute is dependent on one primary key and it doesn't have any composite key. Hence it is in 2NF.

3NF: It is in 2NF and no transitive dependency. Hence this relation is in 3NF.

It is Normalized.

Vaccination Center:

Center Id	Name	Opens at	Closes at	Available Vaccines	Vaccine Name
HYT752	ZP High school	08:00	19:00	1200	Covaxin
	PHC Doodh bowli	10:00	21:00	1500	ZyCoV-D
RTY581			19:00	1200	Covishield
UK1744	ZP Highschool	08:00			Johnson & Johnson
POW622	Elango	11:00	20:00	1200	
LKS657	Pullaladhom	08:00	19:00	1200	ZyCoV-D.

Vaccination Center:

The functional dependency for the Vaccination center is

Vaccination center → Center Id, Name, opens at, closes at, Available Vaccines, Vaccine Name.

1NF: Single and atomic. All the attributes in vaccination center are atomic, because it is taken care in design phase, where all the multivalue attributes are mapped into single value attribute. Hence it is in 1NF.

2NF: It is in 1NF & no Partial functional dependencies and also it doesn't have composite values. Hence it is in 2NF.

3NF: Should be 2NF, no Transitive functional dependencies.

It is in 2NF & no TFD are present in this Relation. Hence it is in 3NF.

Normalized

6. Module 5: Implementation

Execute the following queries

Create and Insert:

Create:

Query:

```
CREATE TABLE Patient (
PatientID varchar(12), --pk
BedNumber  number(3) null,
HomeQuarantine  varchar2(3),
AdmittedDate date null,
AadharNumber  number(12),
Name  varchar2(50),
DateOfBirth date,
City  varchar2(30),
Street  varchar2(30),
State  varchar2(30),
DoctorID number(6) --fk
);

CREATE TABLE Doctor (
DoctorID  number(6), --pk
Name  varchar2(50),
Age  number(2),
Gender  varchar2(6),
Experience  number(2),
HospitalID number(6) --fk
);

CREATE TABLE Hospital (
HospitalID number(6), --pk
HospitalName  varchar2(50),
Branch  varchar2(30),
BedsAvailable  number(3) null,
ReportedDate date, --fk
Place  varchar2(30) --fk
);

CREATE TABLE Hospital_City(
Branch  varchar2(30),
City  varchar2(30)
);

CREATE TABLE HospitalPhoneNumber (
PhoneNumber  number(10), --pk
HospitalID number(6) --fk
);

CREATE TABLE Cases (
ReportedDate date, --pk
```

```
Place  varchar2(30), --pk
NumberOfCases  number(9) null,
CuredRate  number(5,3),
DeathRate  number(5,3),
CFR  number(5,3),
Alert  varchar2(6), --fk
ZPlace  varchar2(30) --fk
);

CREATE TABLE Zone (
Alert  varchar2(6), --pk
Place  varchar2(30), --pk
Pincode  number(6)
);

CREATE TABLE Beneficiary (
BenificiaryID  number(12), --pk
NumberOfDosesTaken  number(1) null,
AadharNumber  number(12),
Name  varchar2(50),
DateOfBirth date,
City  varchar2(30),
Street  varchar2(30),
State  varchar2(30),
VaccinatorID  number(6) --fk
);

CREATE TABLE Vaccinator (
VaccinatorID  number(6), --pk
Name  varchar2(50),
Age  number(3),
Gender  varchar2(6),
CenterID  varchar(6) --fk
);

CREATE TABLE VaccinationCenter (
CenterID  varchar(6), --pk
Name  varchar2(50),
OpensAt timestamp,
ClosesAt timestamp,
AvailableVaccines  number(5) null,
VaccineName  varchar2(30) --fk
);

CREATE TABLE Vaccine (
VaccineName  varchar2(30), --pk
MadeIn  varchar2(50),
MaintainedTemperature  number(4,2),
DosesRequired  number(1),
TimeGap interval day(4) to second(0) null
);

CREATE TABLE Vaccine_Sideeffects(
SideEffects varchar2(30), --pk
VaccineName  varchar2(30) --fk
```

);

Output:

SQL Plus

```
SQL> /* CREATE */
SQL> CREATE TABLE Patient (
  2  PatientID varchar(12), --pk
  3  BedNumber  number(3) null,
  4  HomeQuarantine  varchar2(3),
  5  AdmittedDate date null,
  6  AadharNumber  number(12),
  7  Name  varchar2(50),
  8  DateOfBirth date,
  9  City  varchar2(30),
 10  Street  varchar2(30),
 11  State  varchar2(30),
 12  DoctorID number(6) --fk
 13  );

Table created.

SQL> CREATE TABLE Doctor (
  2  DoctorID  number(6), --pk
  3  Name  varchar2(50),
  4  Age  number(2),
  5  Gender  varchar2(6),
  6  Experience  number(2),
  7  HospitalID number(6) --fk
  8  );

Table created.
```

SQL Plus

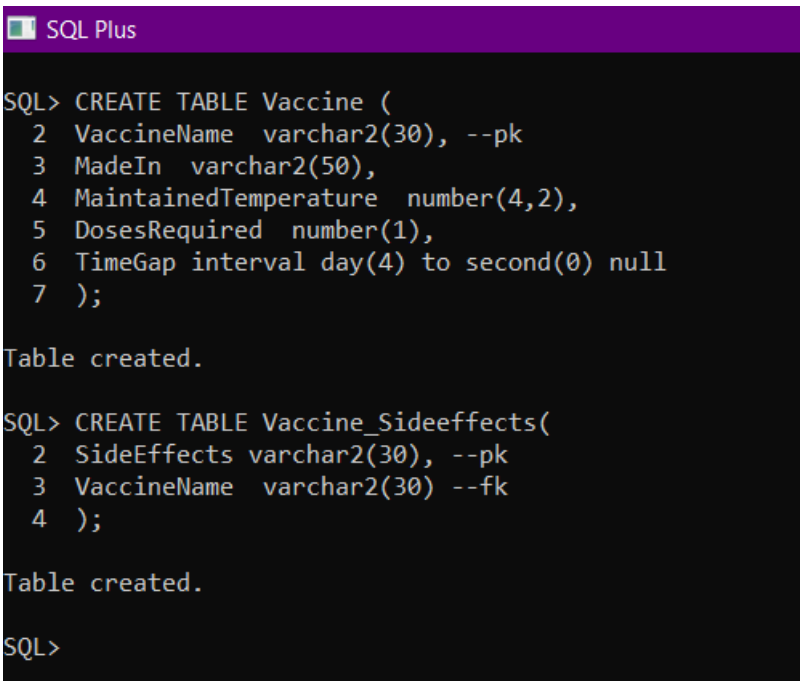
```
SQL> CREATE TABLE Hospital (
  2  HospitalID number(6), --pk
  3  HospitalName  varchar2(50),
  4  Branch  varchar2(30),
  5  BedsAvailable  number(3) null,
  6  ReportedDate date, --fk
  7  Place  varchar2(30) --fk
  8  );

Table created.

SQL> CREATE TABLE Hospital_City(
  2  Branch  varchar2(30),
  3  City  varchar2(30)
  4  );

Table created.

SQL> CREATE TABLE HospitalPhoneNumber (
  2  PhoneNumber  number(10), --pk
  3  HospitalID number(6) --fk
  4  );

Table created.
```

SQL Plus

```
SQL> CREATE TABLE Cases (
  2  ReportedDate date, --pk
  3  Place  varchar2(30), --pk
  4  NumberOfCases  number(9) null,
  5  CuredRate  number(5,3),
  6  DeathRate  number(5,3),
  7  CFR  number(5,3),
  8  Alert  varchar2(6), --fk
  9  ZPlace  varchar2(30) --fk
 10  );

Table created.

SQL> CREATE TABLE Zone (
  2  Alert  varchar2(6), --pk
  3  Place  varchar2(30), --pk
  4  Pincode  number(6)
  5  );

Table created.

SQL> CREATE TABLE Beneficiary (
  2  BenificiaryID  number(12), --pk
  3  NumberOfDosesTaken  number(1) null,
  4  AadharNumber  number(12),
  5  Name  varchar2(50),
  6  DateOfBirth date,
  7  City  varchar2(30),
  8  Street  varchar2(30),
  9  State  varchar2(30),
 10  VaccinatorID  number(6) --fk
 11  );

Table created.
```

SQL Plus

```
SQL>
SQL> CREATE TABLE Vaccinator (
  2  VaccinatorID  number(6), --pk
  3  Name  varchar2(50),
  4  Age  number(3),
  5  Gender  varchar2(6),
  6  CenterID  varchar(6) --fk
  7  );

Table created.

SQL> CREATE TABLE VaccinationCenter (
  2  CenterID  varchar(6), --pk
  3  Name  varchar2(50),
  4  OpensAt timestamp,
  5  ClosesAt timestamp,
  6  AvailableVaccines  number(5) null,
  7  VaccineName  varchar2(30) --fk
  8  );

Table created.
```



Insert:

Query:

```
INSERT INTO Patient VALUES
('&PatientID',&BedNumber,'&HomeQuarantine','&AdmittedDate',&AadharNumber
,'&Name','&DateOfBirth','&City','&Street','&State','&DoctorID');

INSERT INTO Doctor VALUES
(&DoctorID,'&Name',&Age,'&Gender',&Experience,&HospitalID);

INSERT INTO Hospital VALUES
(&HospitalID,'&HospitalName','&Branch',&BedsAvailable,'&ReportedDate','&Plac
e');

INSERT INTO Hospital_City VALUES ('&Branch','&City');

INSERT INTO HospitalPhoneNumber VALUES (&PhoneNumber,'&HospitalID');

INSERT INTO Cases VALUES
('&ReportedDate','&Place',&NumberOfCases,&CuredRate,&DeathRate,&CFR,'&Al
ert','&ZPlace');

INSERT INTO Zone VALUES ('&Alert','&Place',&Pincode);

INSERT INTO Beneficiary VALUES
(&BenificiaryID,&NumberOfDosesTaken,&AadharNumber,'&Name','&DateOfBirt
h','&City','&Street','&State',&VaccinatorID);

INSERT INTO Vaccinator VALUES
(&VaccinatorID,'&Name',&Age,'&Gender','&CenterID');

INSERT INTO VaccinationCenter VALUES
('&CenterID','&Name','&OpensAt','&ClosesAt',&AvailableVaccines,'&VaccineNam
e');

INSERT INTO Vaccine VALUES
```

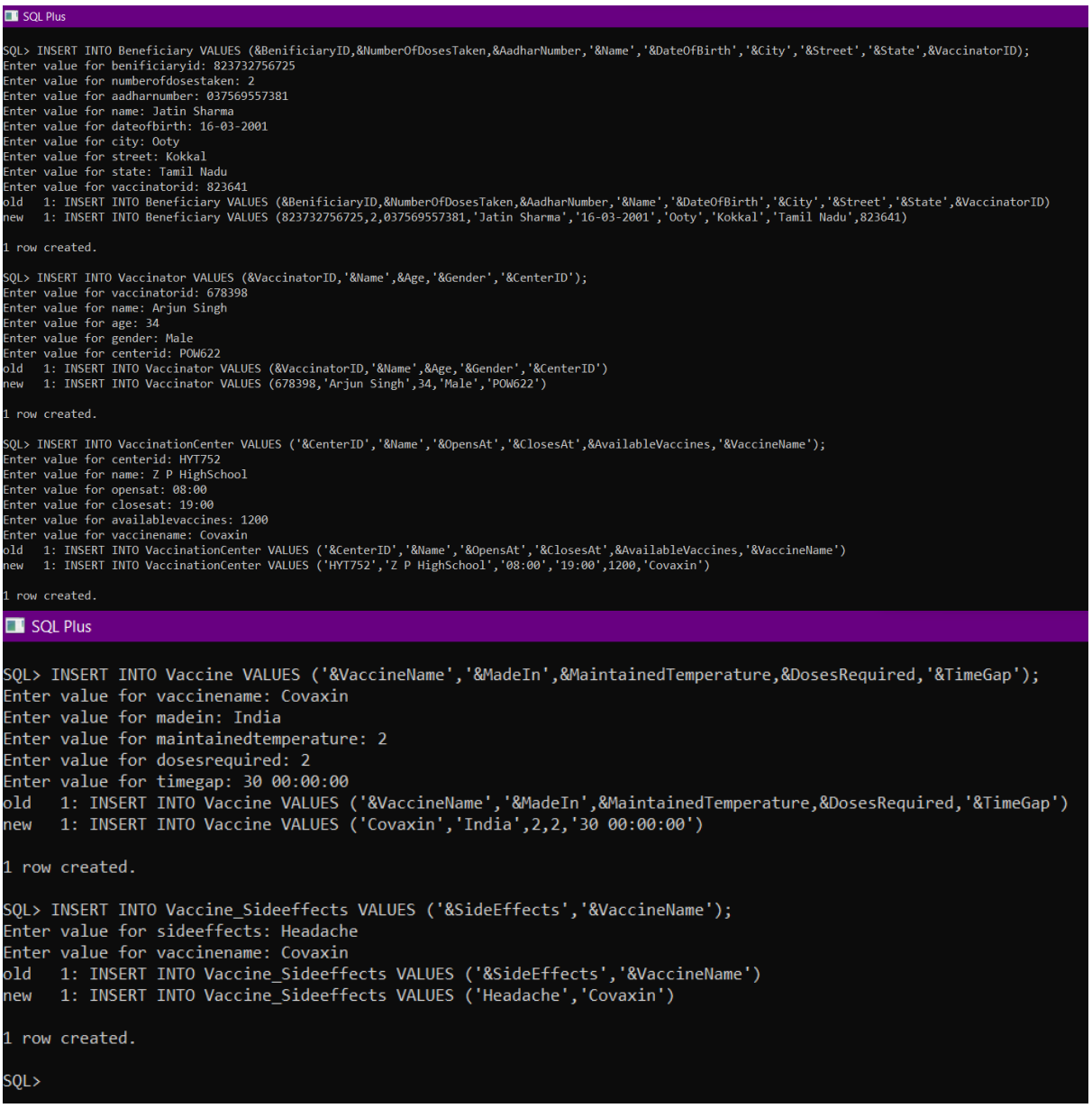
('&VaccineName','&MadeIn',&MaintainedTemperature,&DosesRequired,'&TimeGap');

INSERT INTO Vaccine_Sideeffects VALUES ('&SideEffects','&VaccineName');

Output:

```
SQL Plus

SQL> /* INSERT */
SQL> INSERT INTO Patient VALUES ('&PatientID',&BedNumber,'&HomeQuarantine','&AdmittedDate',&AadharNumber,'&Name','&DateOfBirth','&City','&Street','&State','&DoctorID');
Enter value for patientid: HWTXUITL7893
Enter value for bednumber: 296
Enter value for homequarantine: no
Enter value for admitteddate: 22-03-2019
Enter value for aadharnumber: 456789321065
Enter value for name: Varun Patel
Enter value for dateofbirth: 19-01-1980
Enter value for city: Mumbai
Enter value for street: Colaba
Enter value for state: Maharashtra
Enter value for doctorid: 739272
old   1: INSERT INTO Patient VALUES ('&PatientID',&BedNumber,'&HomeQuarantine','&AdmittedDate',&AadharNumber,'&Name','&DateOfBirth','&City','&Street','&State','&DoctorID')
new   1: INSERT INTO Patient VALUES ('HWTXUITL7893',296,'no','22-03-2019',456789321065,'Varun Patel','19-01-1980','Mumbai','Colaba','Maharashtra','739272')

1 row created.

SQL> INSERT INTO Doctor VALUES (&DoctorID,'&Name',&Age,'&Gender',&Experience,'&HospitalID');
Enter value for doctorid: 688787
Enter value for name: Sita Roy
Enter value for age: 34
Enter value for gender: Female
Enter value for experience: 12
Enter value for hospitalid: 456781
old   1: INSERT INTO Doctor VALUES (&DoctorID,'&Name',&Age,'&Gender',&Experience,'&HospitalID')
new   1: INSERT INTO Doctor VALUES (688787,'Sita Roy',34,'Female',12,'456781')

1 row created.

SQL> INSERT INTO Hospital VALUES (&HospitalID,'&HospitalName','&Branch',&BedsAvailable,'&ReportedDate','&Place');
Enter value for hospitalid: 940124
Enter value for hospitalname: Lotus
Enter value for branch: Boriwali
Enter value for bedsavailable: 104
Enter value for reporteddate: 12-06-2021
Enter value for place: Mumbai
old   1: INSERT INTO Hospital VALUES (&HospitalID,'&HospitalName','&Branch',&BedsAvailable,'&ReportedDate','&Place')
new   1: INSERT INTO Hospital VALUES (940124,'Lotus','Boriwali',104,'12-06-2021','Mumbai')

1 row created.
```

```
SQL Plus
SQL> INSERT INTO Hospital_City VALUES ('&Branch','&City');
Enter value for branch: Boriwali
Enter value for city: Mumbai
old   1: INSERT INTO Hospital_City VALUES ('&Branch','&City')
new   1: INSERT INTO Hospital_City VALUES ('Boriwali','Mumbai')

1 row created.

SQL> INSERT INTO HospitalPhoneNumber VALUES (&PhoneNumber,'&HospitalID');
Enter value for phonenumber: 9385250283
Enter value for hospitalid: 186241
old   1: INSERT INTO HospitalPhoneNumber VALUES (&PhoneNumber,'&HospitalID')
new   1: INSERT INTO HospitalPhoneNumber VALUES (9385250283,'186241')

1 row created.

SQL> INSERT INTO Cases VALUES ('&ReportedDate','&Place',&NumberOfCases,&CuredRate,&DeathRate,&CFR,'&Alert','&ZPlace');
Enter value for reporteddate: 20-04-2019
Enter value for place: Mumbai
Enter value for numberofcases: 2300
Enter value for curedrate: 97
Enter value for deathrate: 0.04
Enter value for cfr: 10
Enter value for alert: Red
Enter value for zplace: Mumbai
old   1: INSERT INTO Cases VALUES ('&ReportedDate','&Place',&NumberOfCases,&CuredRate,&DeathRate,&CFR,'&Alert','&ZPlace')
new   1: INSERT INTO Cases VALUES ('20-04-2019','Mumbai',2300,97,0.04,10,'Red','Mumbai')

1 row created.

SQL> INSERT INTO Zone VALUES ('&Alert','&Place',&Pincode);
Enter value for alert: Red
Enter value for place: Mumbai
Enter value for pincode: 400004
old   1: INSERT INTO Zone VALUES ('&Alert','&Place',&Pincode)
new   1: INSERT INTO Zone VALUES ('Red','Mumbai',400004)

1 row created.
```



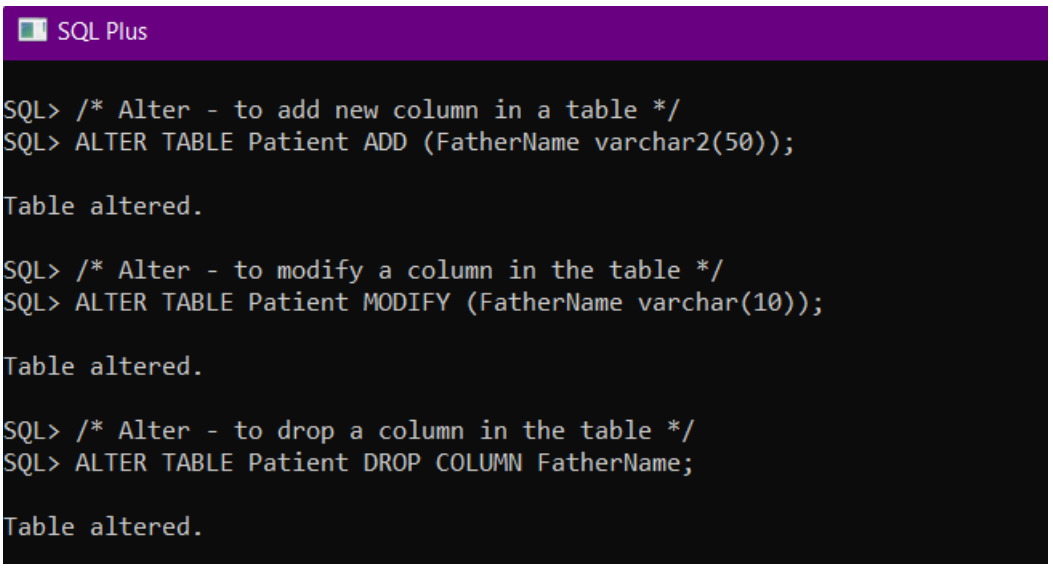
Alter, Delete and Update:

Alter:

Query:

ALTER TABLE Patient ADD (FatherName varchar2(50));
ALTER TABLE Patient MODIFY (FatherName varchar(10));
ALTER TABLE Patient DROP COLUMN FatherName;

Output:

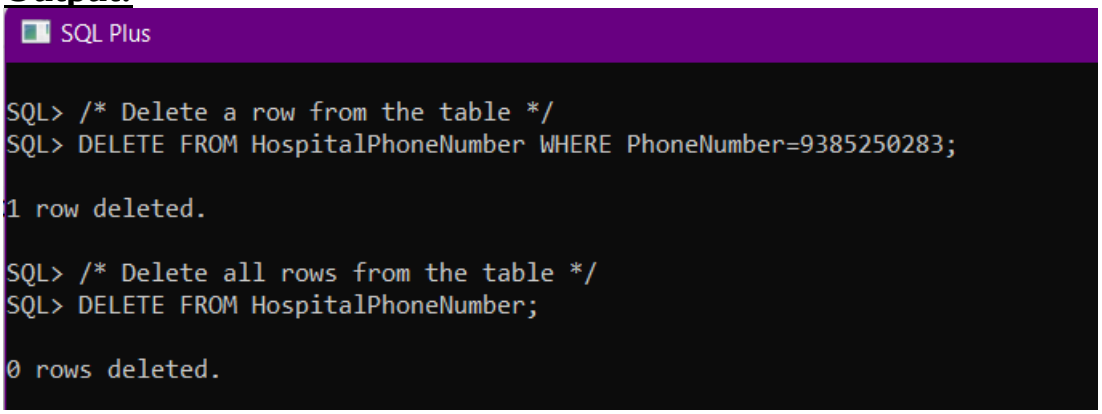


Delete:

Query:

DELETE FROM HospitalPhoneNumber WHERE PhoneNumber=9385250283;
DELETE FROM HospitalPhoneNumber;

Output:

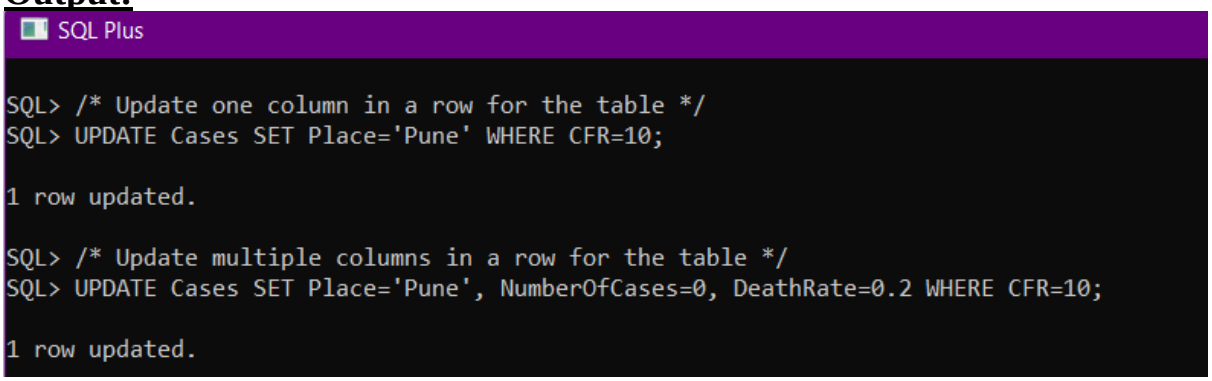


Update:

Query:

UPDATE Cases SET Place='Pune' WHERE CFR=10;
UPDATE Cases SET Place='Pune', NumberOfCases=0, DeathRate=0.2 WHERE CFR=10;

Output:



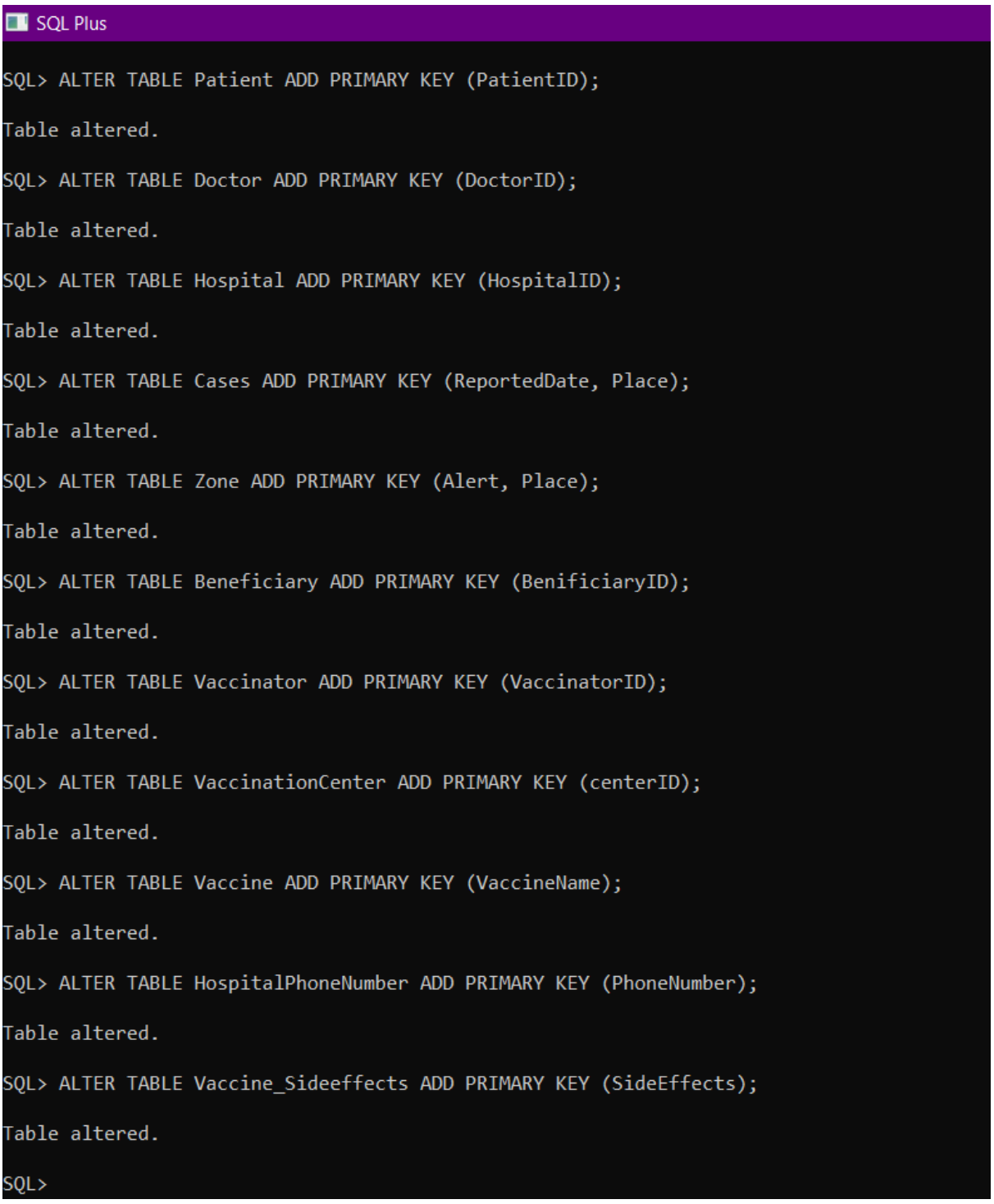
Primary key and foreign key constraint:

Primary key:

Query:

```
ALTER TABLE Patient ADD PRIMARY KEY (PatientID);

ALTER TABLE Doctor ADD PRIMARY KEY (DoctorID);

ALTER TABLE Hospital ADD PRIMARY KEY (HospitalID);

ALTER TABLE Cases ADD PRIMARY KEY (ReportedDate, Place);

ALTER TABLE Zone ADD PRIMARY KEY (Alert, Place);

ALTER TABLE Beneficiary ADD PRIMARY KEY (BenificiaryID);

ALTER TABLE Vaccinator ADD PRIMARY KEY (VaccinatorID);

ALTER TABLE VaccinationCenter ADD PRIMARY KEY (centerID);

ALTER TABLE Vaccine ADD PRIMARY KEY (VaccineName);

ALTER TABLE HospitalPhoneNumber ADD PRIMARY KEY (PhoneNumber);

ALTER TABLE Vaccine_Sideeffects ADD PRIMARY KEY (SideEffects);
```

Output:



Foreign key:

Query:

ALTER TABLE Patient ADD CONSTRAINT FK_Patient FOREIGN KEY (DoctorID) REFERENCES Doctor(DoctorID);

ALTER TABLE Doctor ADD CONSTRAINT FK_Doctor FOREIGN KEY (HospitalID) REFERENCES Hospital(HospitalID);

ALTER TABLE Hospital ADD CONSTRAINT FK_Hospital FOREIGN KEY (ReportedDate, Place) REFERENCES Cases(ReportedDate, Place);

ALTER TABLE HospitalPhoneNumber ADD CONSTRAINT FK_HospitalPhoneNumber FOREIGN KEY (HospitalID) REFERENCES Hospital(HospitalID);

ALTER TABLE Cases ADD CONSTRAINT FK_Cases FOREIGN KEY (Alert, ZPlace) REFERENCES Zone(Alert, Place);

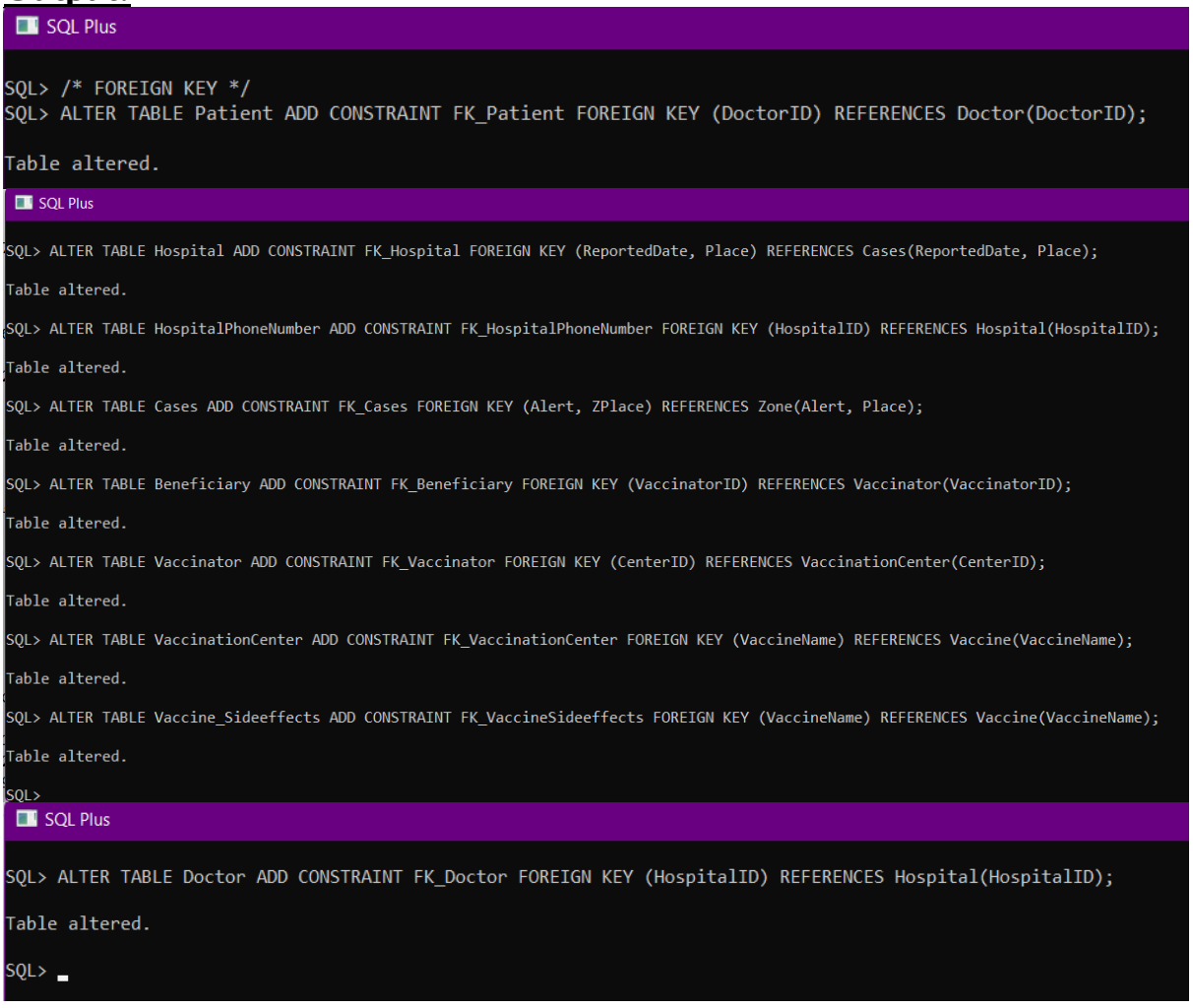
ALTER TABLE Beneficiary ADD CONSTRAINT FK_Beneficiary FOREIGN KEY (VaccinatorID) REFERENCES Vaccinator(VaccinatorID);

ALTER TABLE Vaccinator ADD CONSTRAINT FK_Vaccinator FOREIGN KEY (CenterID) REFERENCES VaccinationCenter(CenterID);

ALTER TABLE VaccinationCenter ADD CONSTRAINT FK_VaccinationCenter FOREIGN KEY (VaccineName) REFERENCES Vaccine(VaccineName);

ALTER TABLE Vaccine_Sideeffects ADD CONSTRAINT FK_VaccineSideeffects FOREIGN KEY (VaccineName) REFERENCES Vaccine(VaccineName);

Output:

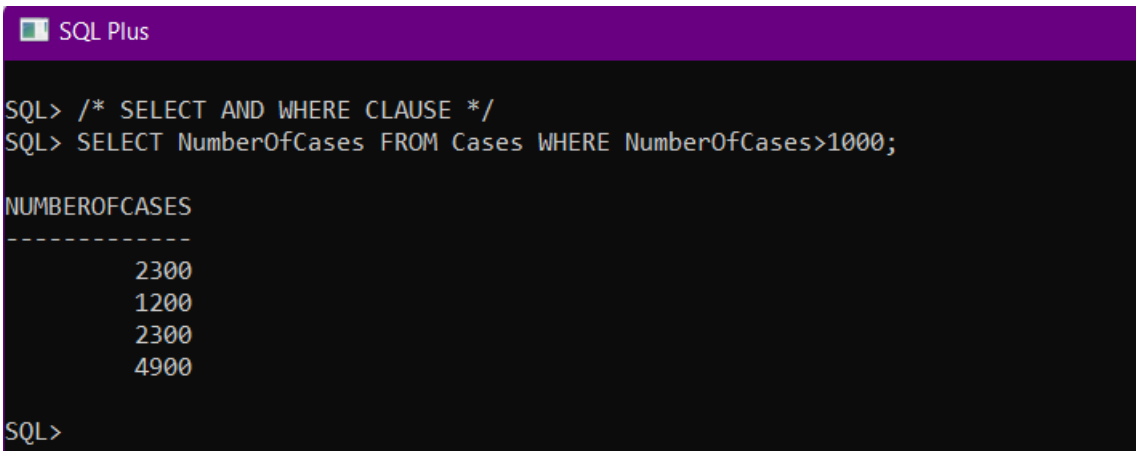


Select with Where clause:

Query:

SELECT NumberOfCases FROM Cases WHERE NumberOfCases>1000;

Output:

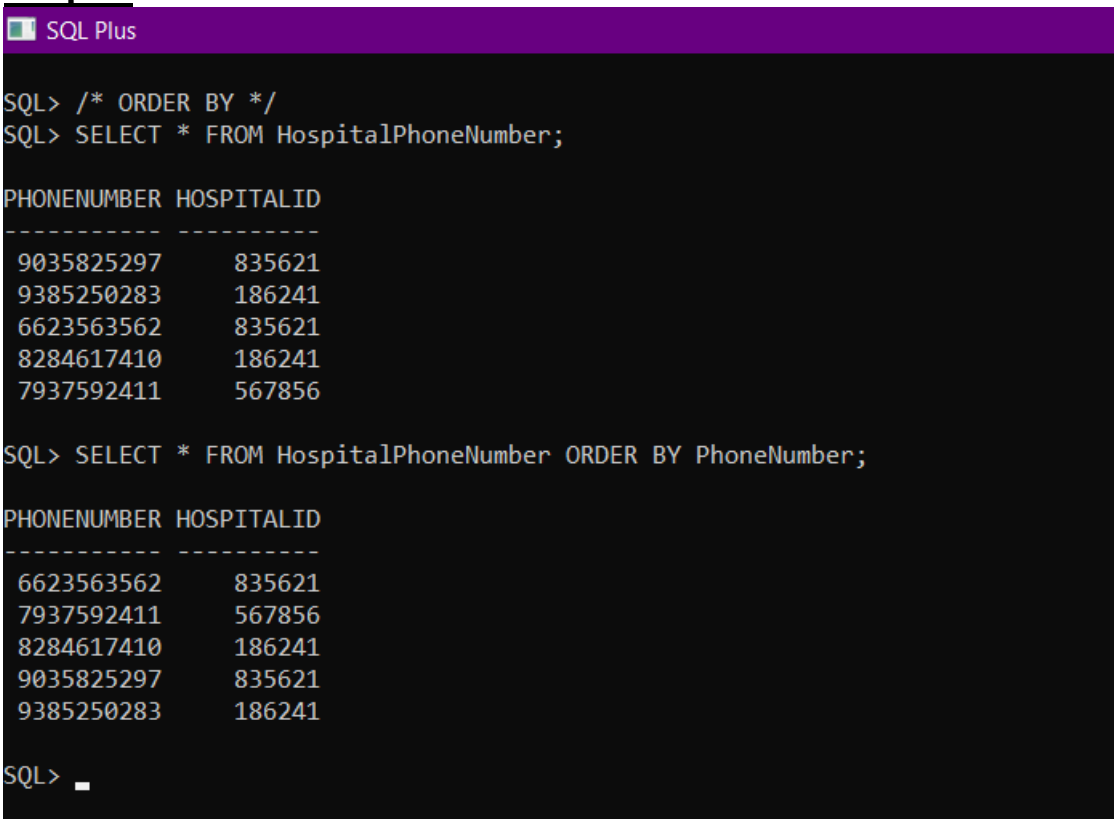


Order by clause:

Query:

SELECT * FROM HospitalPhoneNumber ORDER BY PhoneNumber;

Output:



Like clause:

Query:

SELECT VaccineName FROM Vaccine WHERE VaccineName LIKE 'Co%';

Output:

```
SQL Plus

SQL> /* LIKE CLAUSE */
SQL> SELECT VaccineName FROM Vaccine WHERE VaccineName LIKE 'Co%';

VACCINENAME
------------------------------
Covaxin
Covidshield

SQL>
```

Is null/ is not null:

Null:

Query:

SELECT Name FROM Patient WHERE BedNumber IS NULL;

Output:

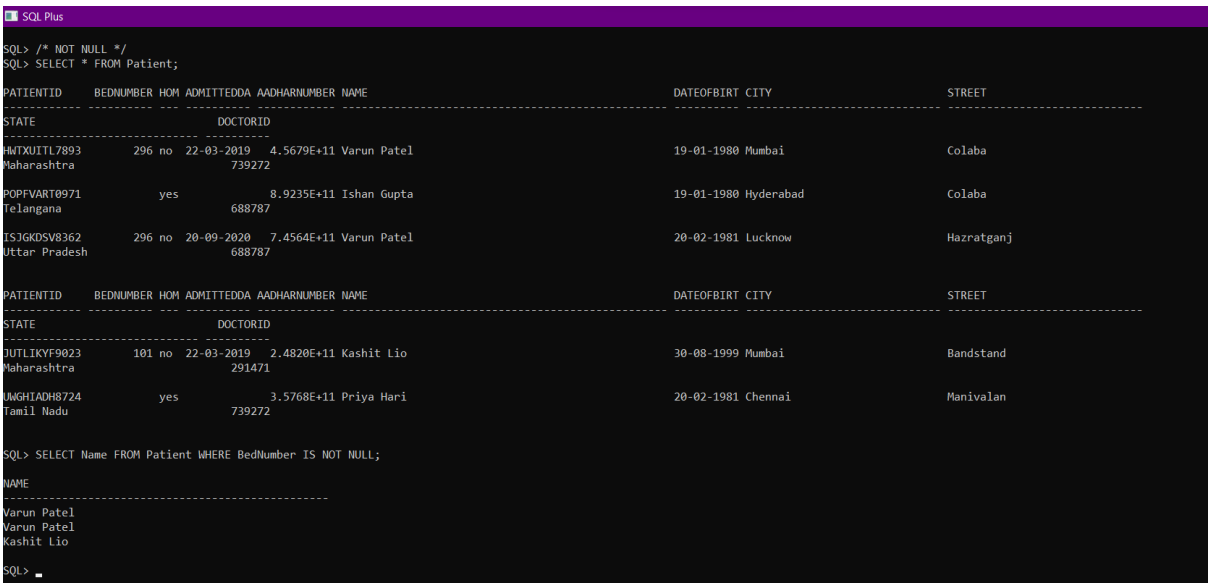
```
SQL Plus

SQL> /* NULL */
SQL> SELECT * FROM Patient;

PATIENTID    BEDNUMBER HOM ADMITTEDDA AADHARNUMBER NAME                                               DATEOFBIRT CITY                         STREET
---------- ---------- --- ---------- ------------ -------------------------------------------------- ---------- ------------------------------ ------------------------------
STATE                          DOCTORID
------------------------------ ----------
HWTXUITL7893        296 no  22-03-2019   4.5679E+11 Varun Patel                                        19-01-1980 Mumbai                         Colaba
Maharashtra                       739272

POPFVART0971            yes             8.9235E+11 Ishan Gupta                                        19-01-1980 Hyderabad                      Colaba
Telangana                         688787

ISJGKDSV8362        296 no  20-09-2020   7.4564E+11 Varun Patel                                        20-02-1981 Lucknow                        Hazratganj
Uttar Pradesh                     688787


PATIENTID    BEDNUMBER HOM ADMITTEDDA AADHARNUMBER NAME                                               DATEOFBIRT CITY                         STREET
---------- ---------- --- ---------- ------------ -------------------------------------------------- ---------- ------------------------------ ------------------------------
STATE                          DOCTORID
------------------------------ ----------
JUTLIKYF9023        101 no  22-03-2019   2.4820E+11 Kashit Lio                                         30-08-1999 Mumbai                         Bandstand
Maharashtra                       291471

UWGHIADH8724            yes             3.5768E+11 Priya Hari                                         20-02-1981 Chennai                        Manivalan
Tamil Nadu                        739272


SQL> SELECT Name FROM Patient WHERE BedNumber IS NULL;

NAME
--------------------------------------------------
Ishan Gupta
Priya Hari

SQL>
```

Not null:

Query:

SELECT Name FROM Patient WHERE BedNumber IS NOT NULL;

Output:

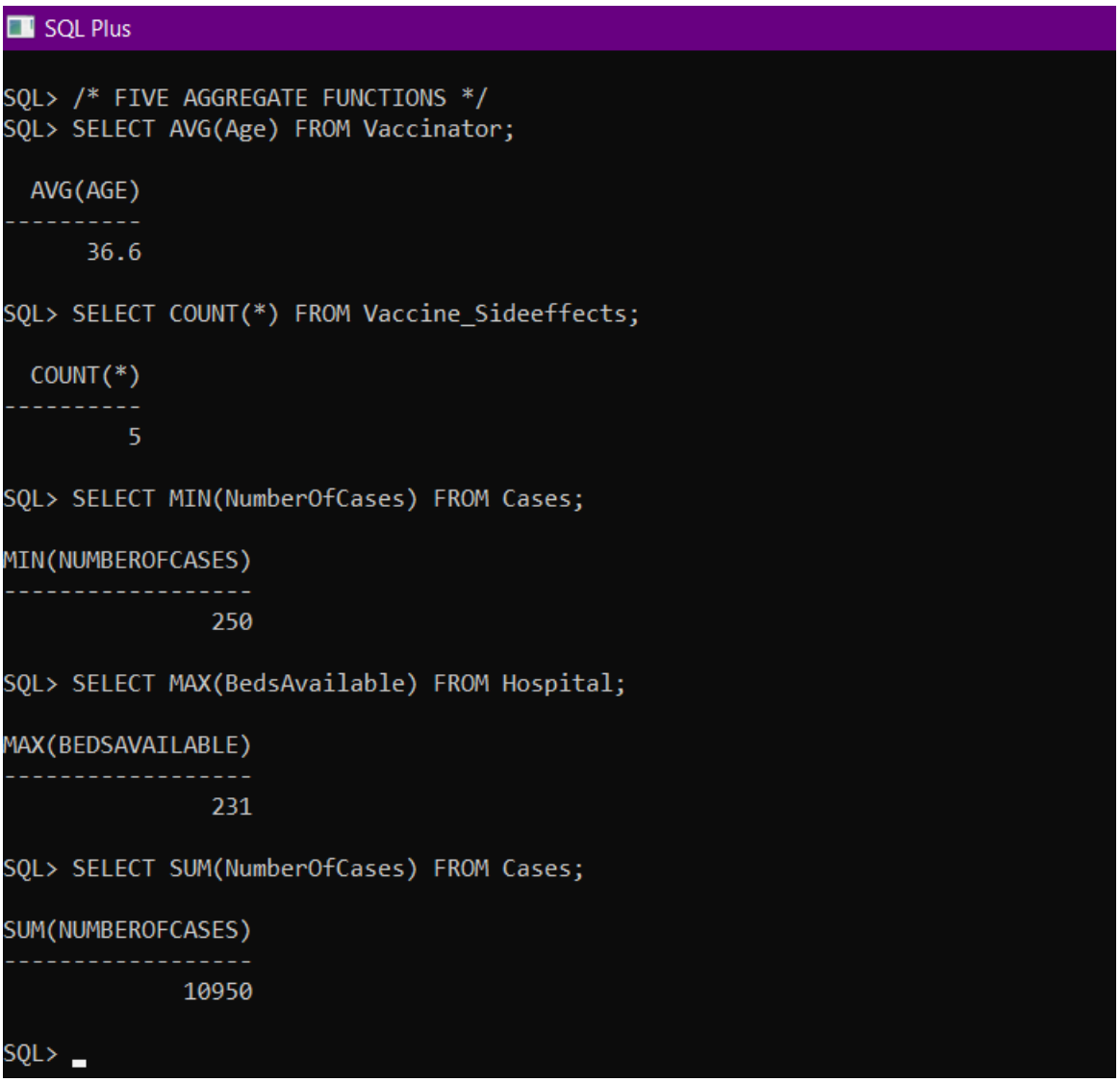


Any five Aggregate functions:

Query:

SELECT AVG(Age) FROM Vaccinator;
SELECT COUNT(*) FROM Vaccine_Sideeffects;
SELECT MIN(NumberOfCases) FROM Cases;
SELECT MAX(BedsAvailable) FROM Hospital;
SELECT SUM(NumberOfCases) FROM Cases;

Output:

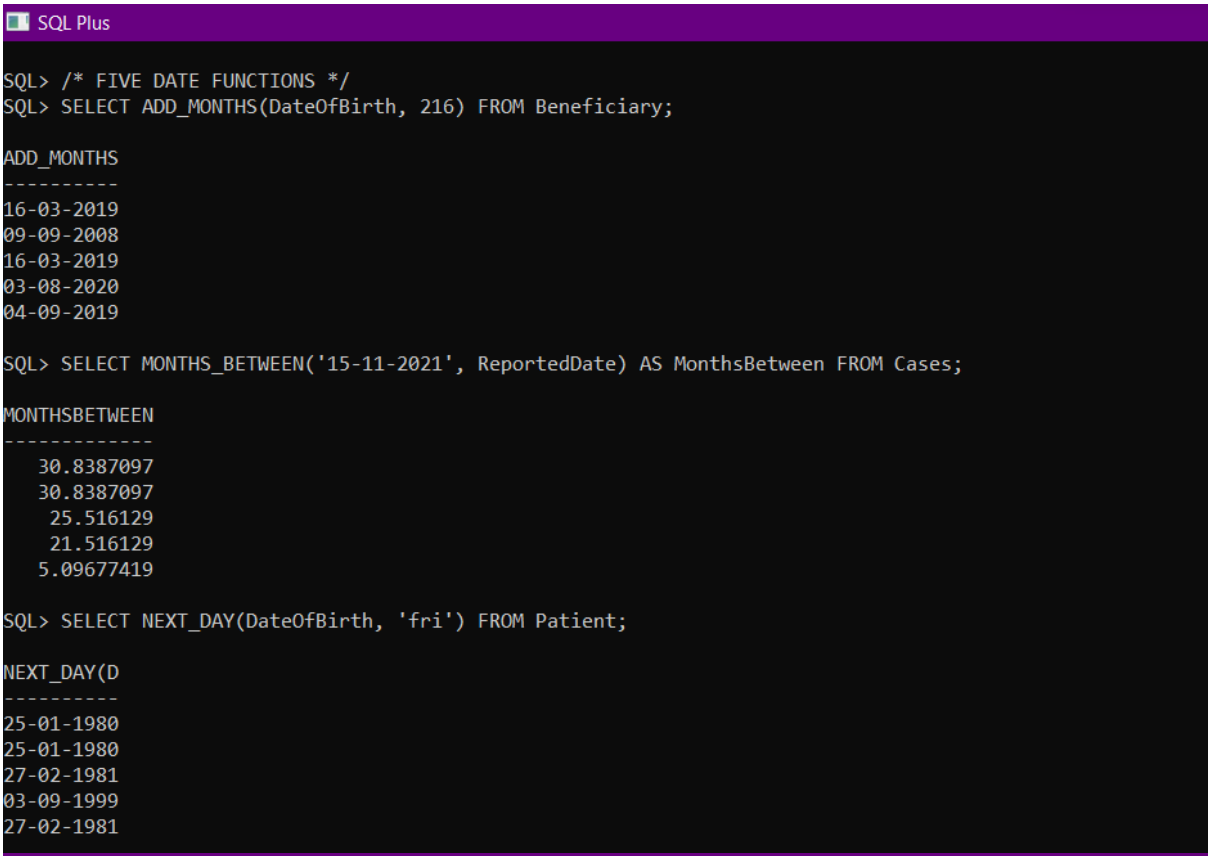


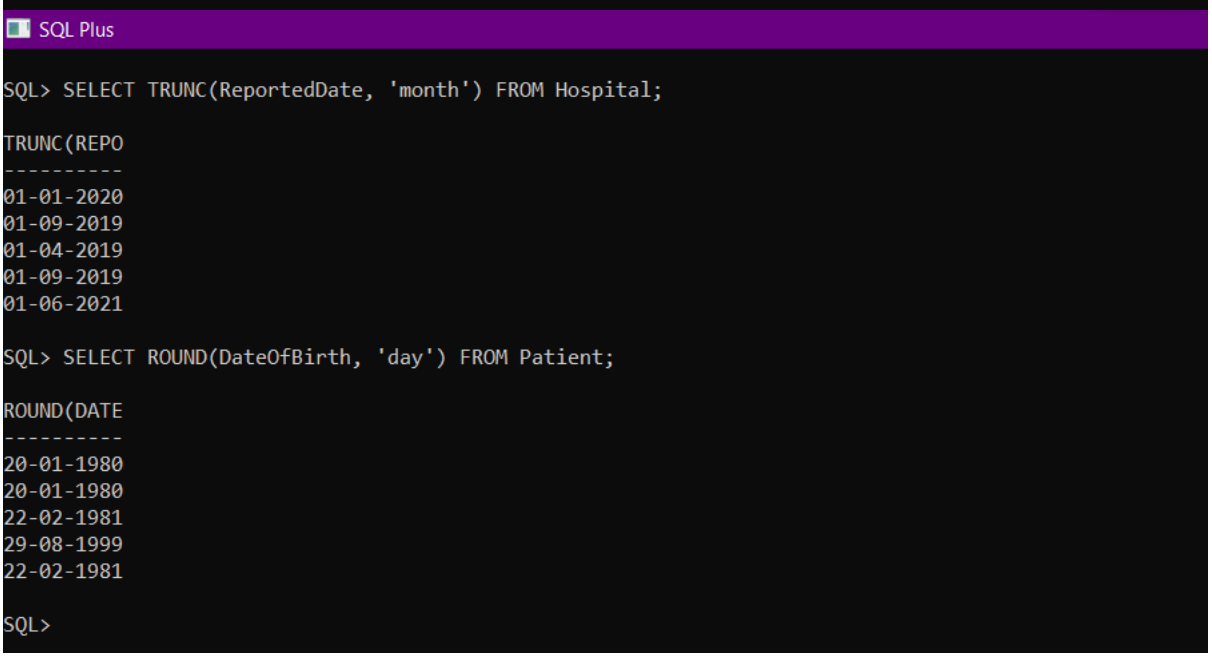
Any five date functions:

Query:

SELECT ADD_MONTHS(DateOfBirth, 216) FROM Beneficiary;
SELECT MONTHS_BETWEEN('15-11-2021', ReportedDate) AS MonthsBetween FROM Cases;
SELECT NEXT_DAY(DateOfBirth, 'fri') FROM Patient;
SELECT TRUNC(ReportedDate, 'month') FROM Hospital;
SELECT ROUND(DateOfBirth, 'day') FROM Patient;

Output:



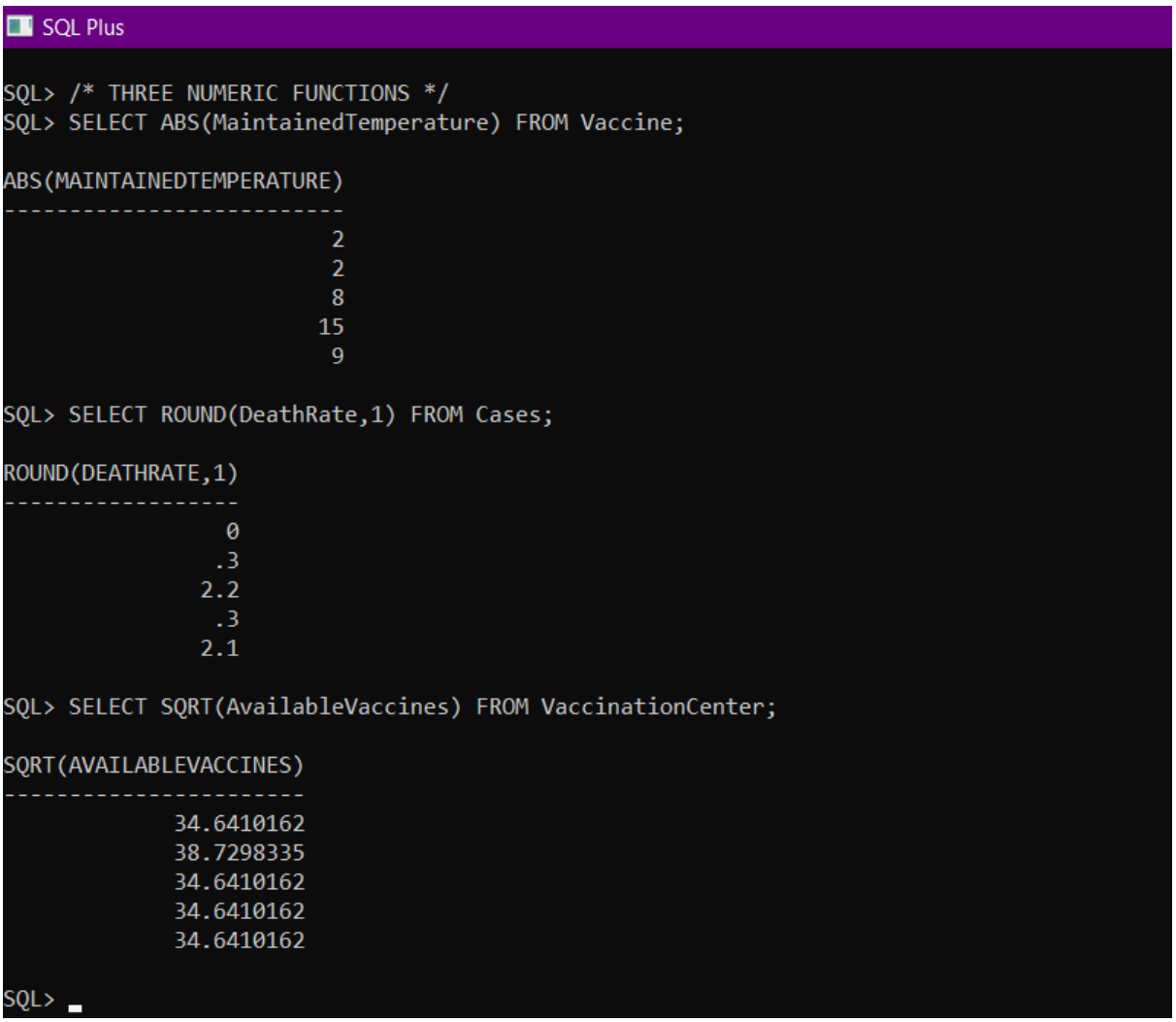


Any three numeric functions:

Query:

SELECT ABS(MaintainedTemperature) FROM Vaccine;
SELECT ROUND(DeathRate,1) FROM Cases;
SELECT SQRT(AvailableVaccines) FROM VaccinationCenter;

Output:



Any five String functions:

Query:

SELECT REPLACE(Name, 'i', 'r') FROM Doctor;
SELECT LOWER(PatientID) FROM Patient;
SELECT LENGTH(VaccineName) FROM Vaccine;
SELECT LPAD(Alert, 8, '*') FROM Zone;
SELECT SUBSTR(Name, 0, 6) FROM Patient;

Output:

SQL Plus

```
SQL> /* FIVE STRING FUNCTIONS */
SQL> SELECT REPLACE(Name, 'i', 'r') FROM Doctor;

REPLACE(NAME,'I','R')
--------------------------------------------------
Srta Roy
Ram Babu
Srta Roy
Harr Om
Ram Babu

SQL> SELECT LOWER(PatientID) FROM Patient;

LOWER(PATIEN
------------
hwtxuitl7893
isjgkdsv8362
jutlikyf9023
popfvart0971
uwghiadh8724

SQL> SELECT LENGTH(VaccineName) FROM Vaccine;

LENGTH(VACCINENAME)
-------------------
                  7
                 11
                 19
                  6
                  7
```

SQL Plus

```
SQL> SELECT LPAD(Alert, 8, '*') FROM Zone;

LPAD(ALERT,8,'*')
---------------------------------
***Green
***Green
**Orange
*****Red
*****Red

SQL> SELECT SUBSTR(Name, 0, 6) FROM Patient;

SUBSTR(NAME,0,6)
------------------------
Varun
Ishan
Varun
Kashit
Priya

SQL>
```

Group by and having:

Group by:

Query:
SELECT HospitalID, COUNT(*) FROM Doctor GROUP BY HospitalID;

Output:

SQL Plus

```
SQL> /* GROUP BY */
SQL> SELECT HospitalID, COUNT(*) FROM Doctor GROUP BY HospitalID;

HOSPITALID   COUNT(*)
---------- ----------
    456781          2
    186241          2
    940124          1

SQL>
```

having:

Query:
SELECT VaccineName, COUNT(*) FROM VaccinationCenter GROUP BY VaccineName HAVING COUNT(*)<2;

Output:

SQL Plus

```
SQL> /* HAVING */
SQL> SELECT VaccineName, COUNT(*) FROM VaccinationCenter GROUP BY VaccineName HAVING COUNT(*)<2;

VACCINENAME                    COUNT(*)
------------------------------ ----------
Covidshield                             1
Johnson and Johnson                     1
Covaxin                                 1

SQL>
```

Join more than two tables:

Query:
SELECT DISTINCT Vaccinator.Name, Beneficiary.Name, VaccinationCenter.CenterID, Vaccine.VaccineName FROM Beneficiary, Vaccinator, VaccinationCenter, Vaccine WHERE Beneficiary.VaccinatorID=Vaccinator.VaccinatorID and Vaccinator.CenterID=VaccinationCenter.CenterID and VaccinationCenter.VaccineName=Vaccine.VaccineName;

Output:

SQL Plus

```
SQL> /* JOIN MORE THAN TWO TABLES */
SQL> SELECT DISTINCT Vaccinator.Name, Beneficiary.Name, VaccinationCenter.CenterID, Vaccine.VaccineName FROM Beneficiary, Vaccinator, VaccinationC
enter, Vaccine WHERE Beneficiary.VaccinatorID=Vaccinator.VaccinatorID and Vaccinator.CenterID=VaccinationCenter.CenterID and VaccinationCenter.Vac
cineName=Vaccine.VaccineName;

NAME                                               NAME                                               CENTER VACCINENAME
-------------------------------------------------- -------------------------------------------------- ------ ------------------------------
Arjun Singh                                        Hrithik Mehta                                      POW622 Johnson and Johnson
Aadesh Gupta                                       Disha Devi                                         UKI744 Covidshield
Arjun Singh                                        Jatin Sharma                                       UKI744 Covidshield

SQL>
```

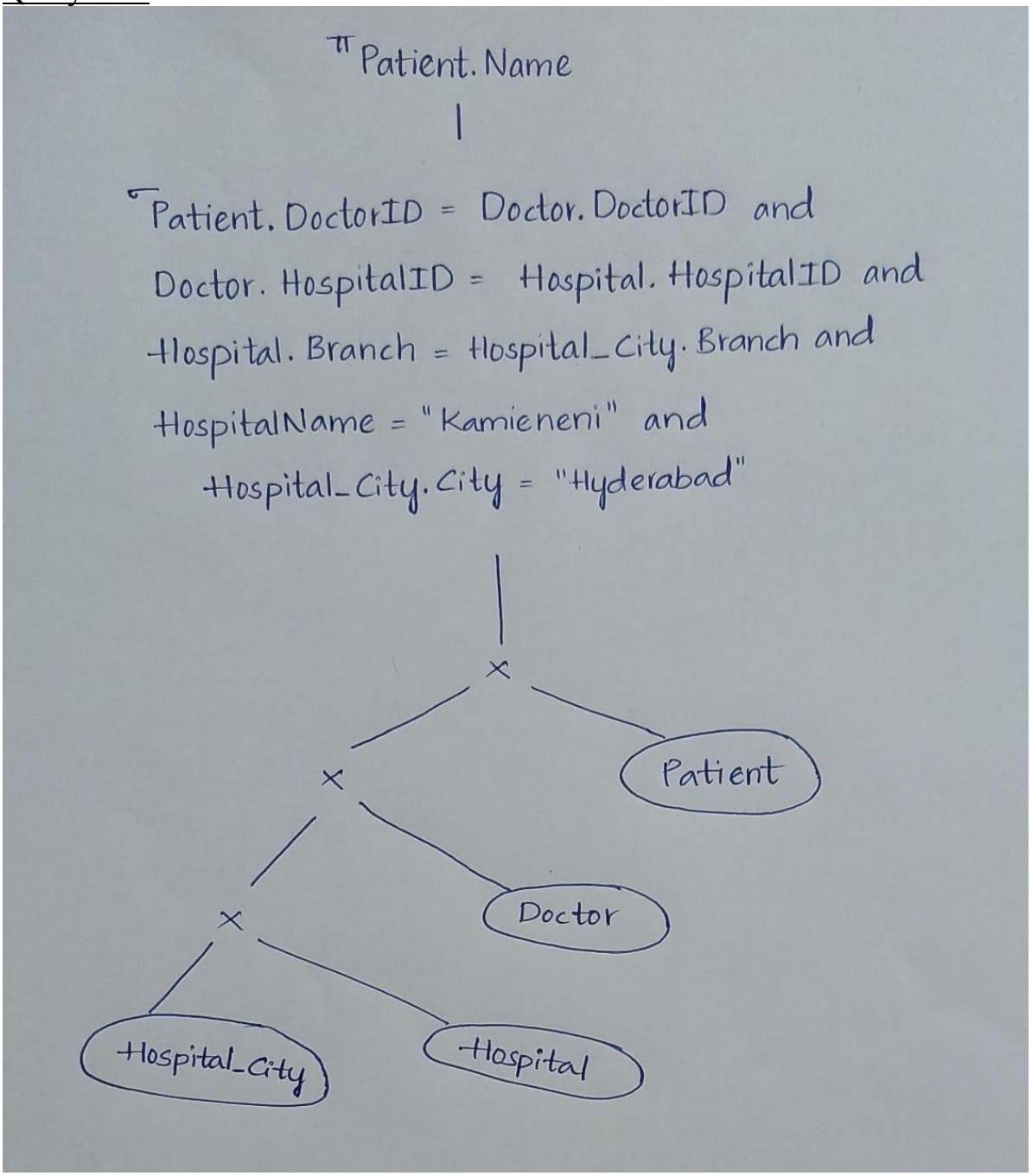
7. Module 6: Query Optimization

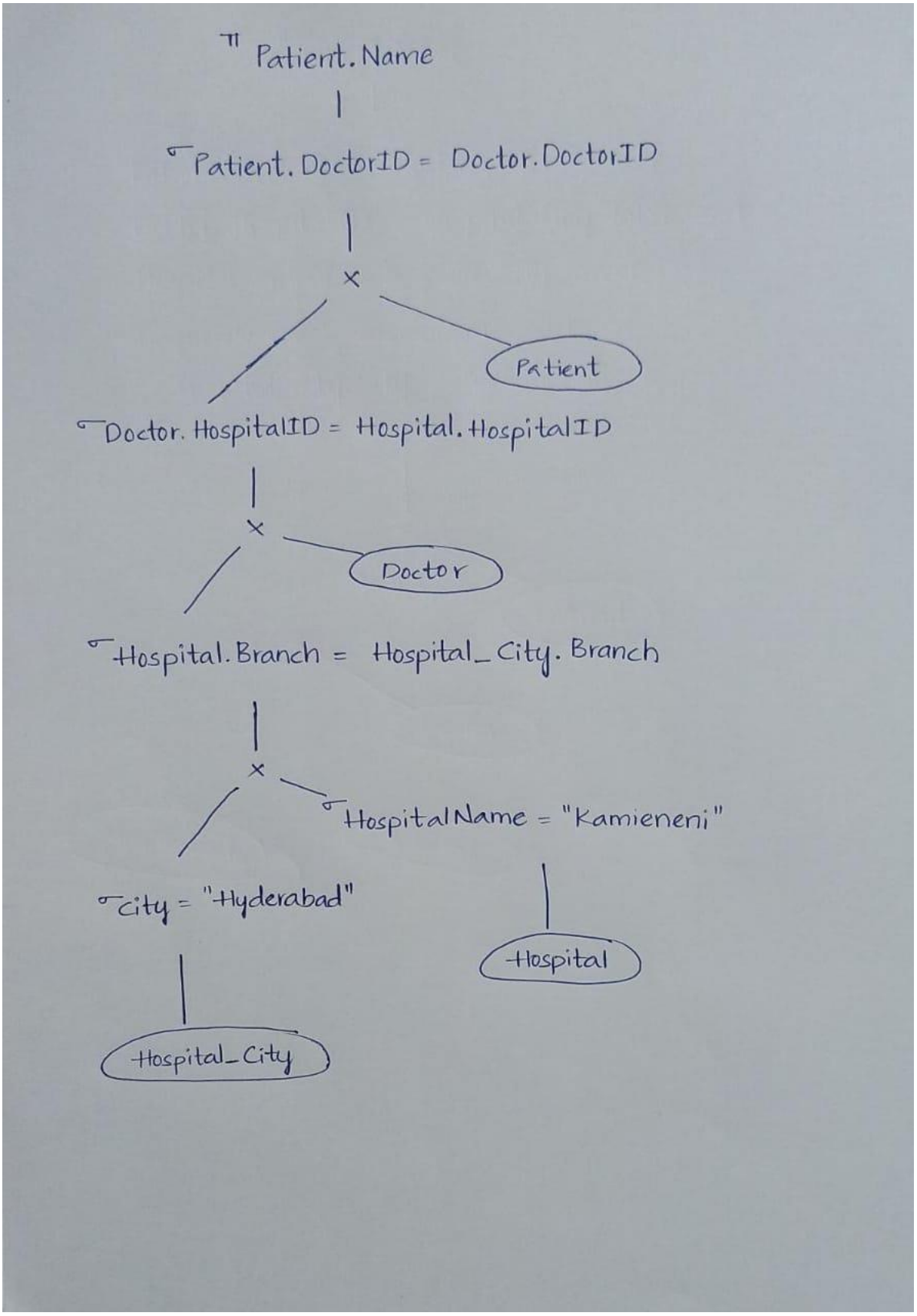
Query-1:

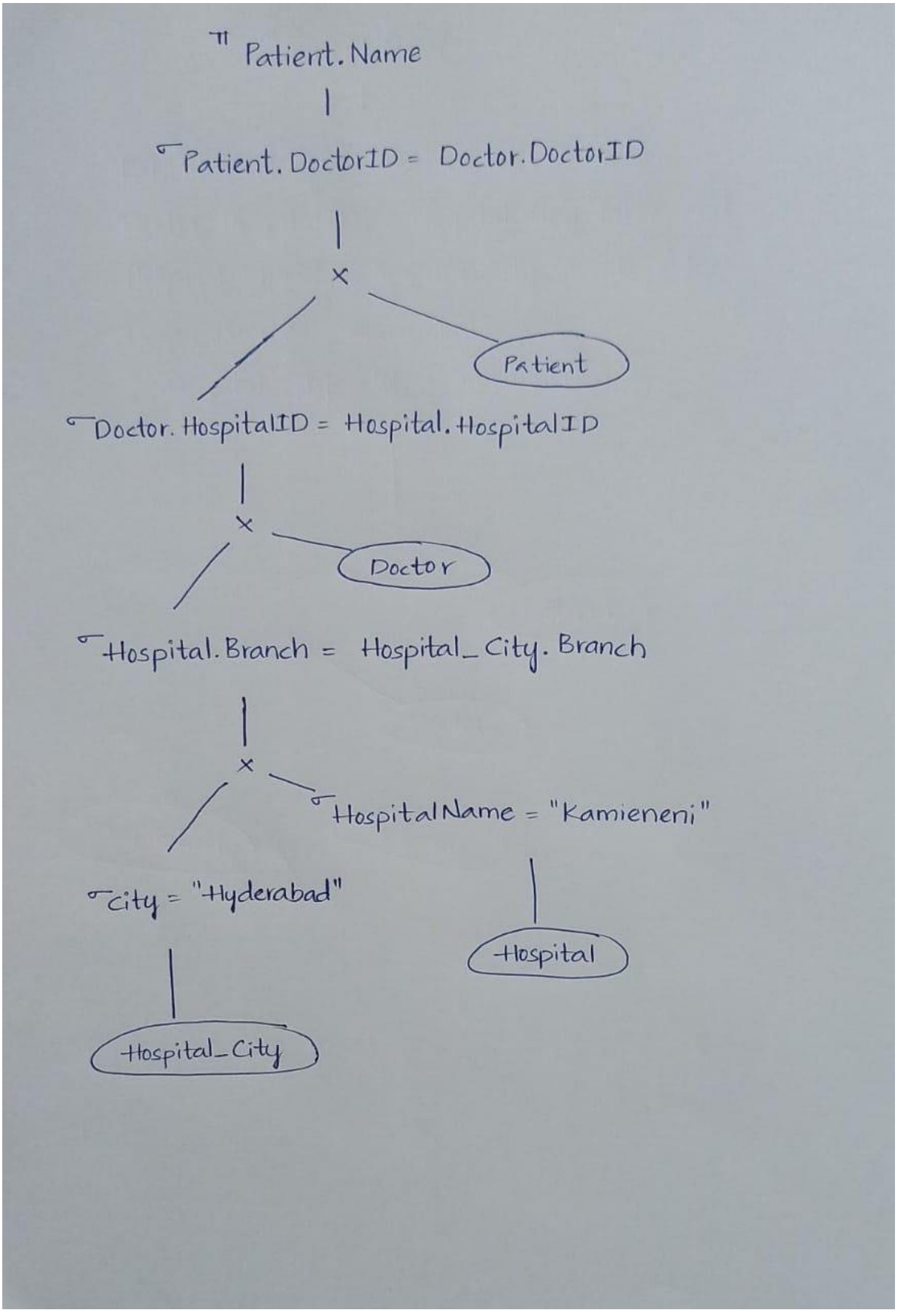
Get the patient name who is home quarantine and under doctor who works in kamineni hospital at hyderabad.

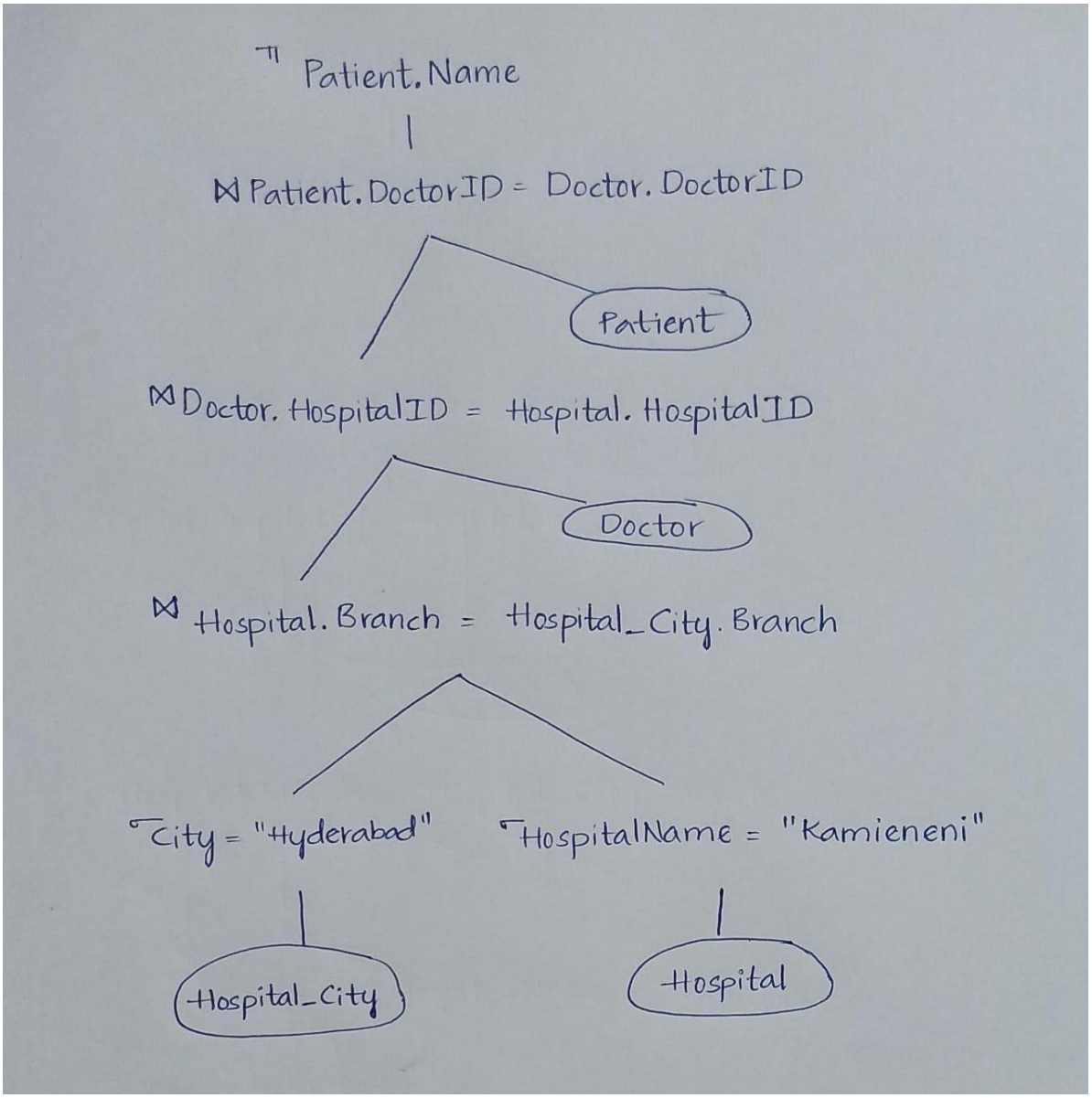
```
SELECT Patient.Name
FROM Patient, Doctor, Hospital, Hosiptal_City
WHERE Patient.DoctorID = Doctor.DoctorID and Doctor.HosiptalID =
Hospital.HospitalID and Hospital.Branch = Hospital_City.Branch and
HospitalName = 'Kamieneni' and Hospital_City.City = 'Hyderabad';
```

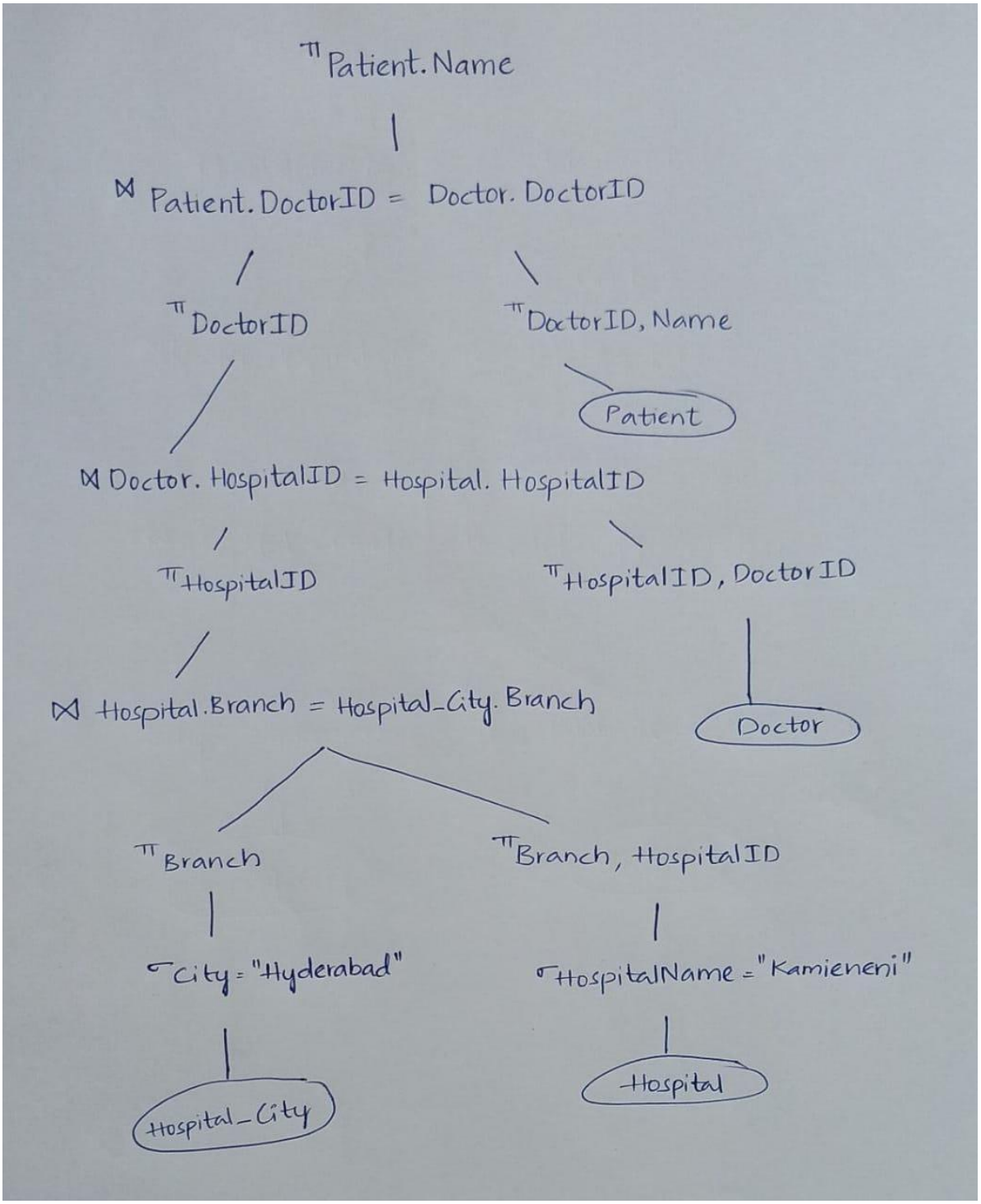
Query tree:



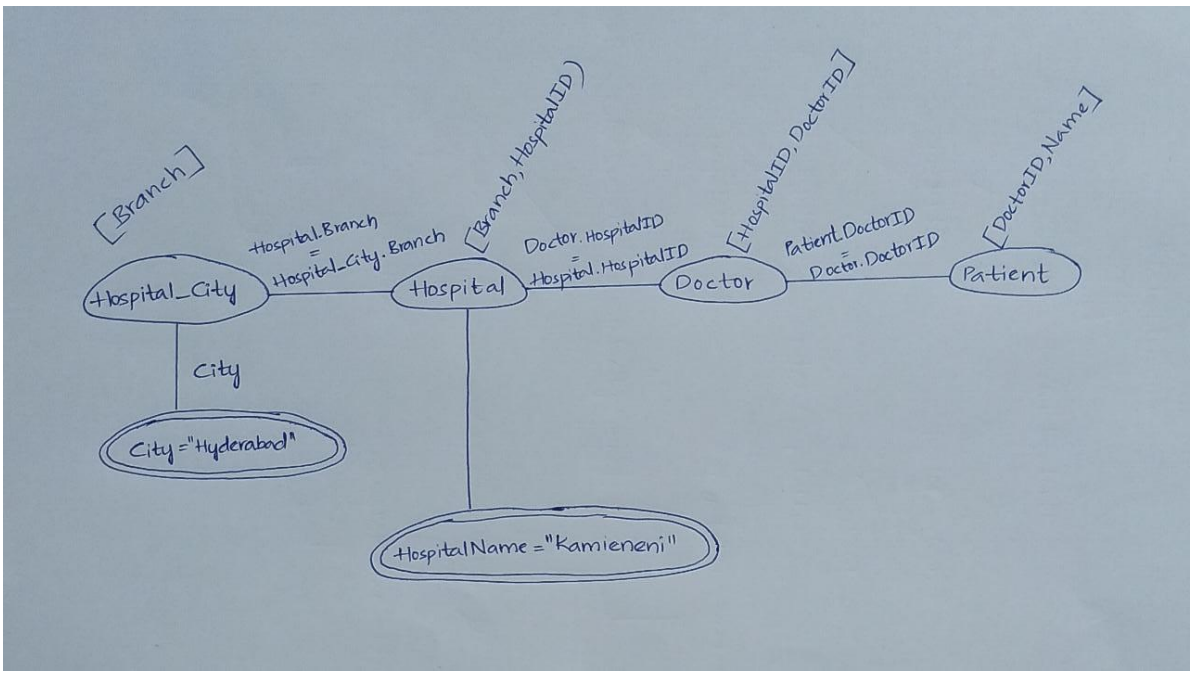

Π Patient.Name
σ Patient.DoctorID = Doctor.DoctorID
×
Patient
σ Doctor.HospitalID = Hospital.HospitalID
×
Doctor
σ Hospital.Branch = Hospital_City.Branch
×
σ HospitalName = "Kamieneni"
Hospital
σ City = "Hyderabad"
Hospital_City


Π Patient.Name
σ Patient.DoctorID = Doctor.DoctorID
×
Patient
σ Doctor.HospitalID = Hospital.HospitalID
×
Doctor
σ Hospital.Branch = Hospital_City.Branch
×
σ HospitalName = "Kamieneni"
σ City = "Hyderabad"
Hospital
Hospital_City


Π Patient.Name
⋈ Patient.DoctorID = Doctor.DoctorID
Patient
⋈ Doctor.HospitalID = Hospital.HospitalID
Doctor
⋈ Hospital.Branch = Hospital_City.Branch
σ City = "Hyderabad"
σ HospitalName = "Kamineni"
Hospital_City
Hospital


π Patient.Name
⋈ Patient.DoctorID = Doctor.DoctorID
π DoctorID
π DoctorID, Name
Patient
⋈ Doctor.HospitalID = Hospital.HospitalID
π HospitalID
π HospitalID, DoctorID
Doctor
⋈ Hospital.Branch = Hospital_City.Branch
π Branch
π Branch, HospitalID
σ City = "Hyderabad"
σ HospitalName = "Kamineni"
Hospital_City
Hospital

Query graph:

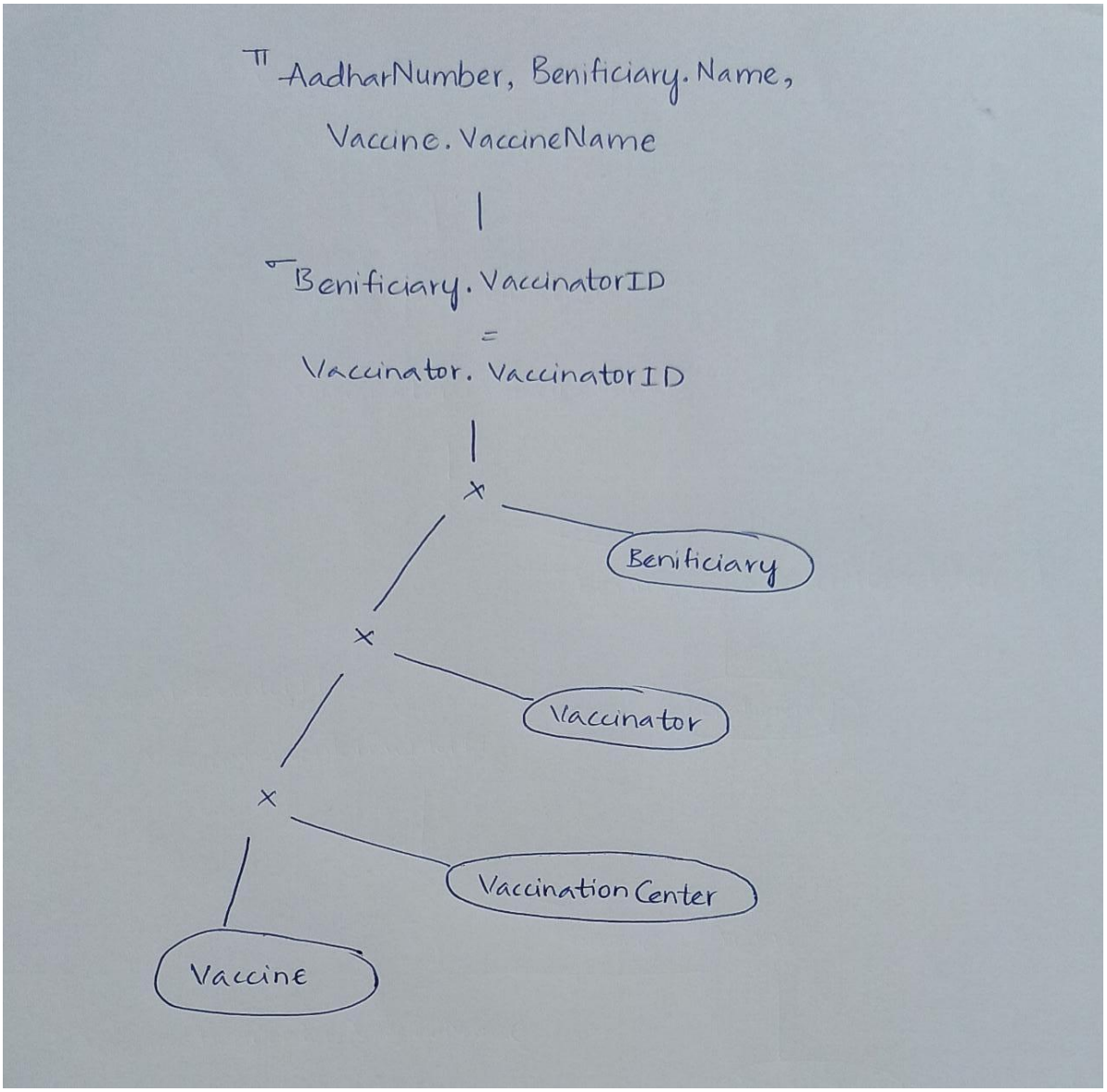


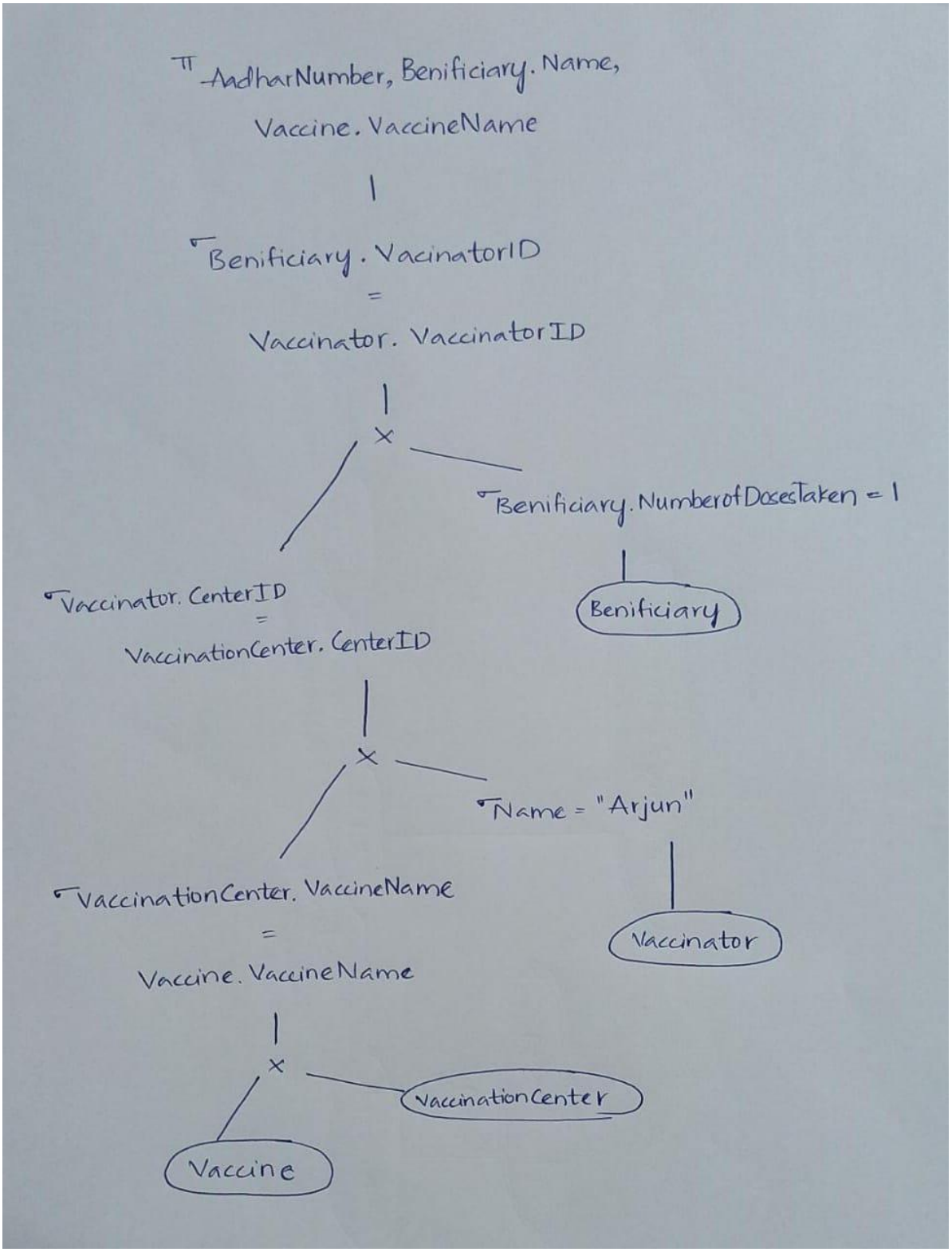
Query-2:

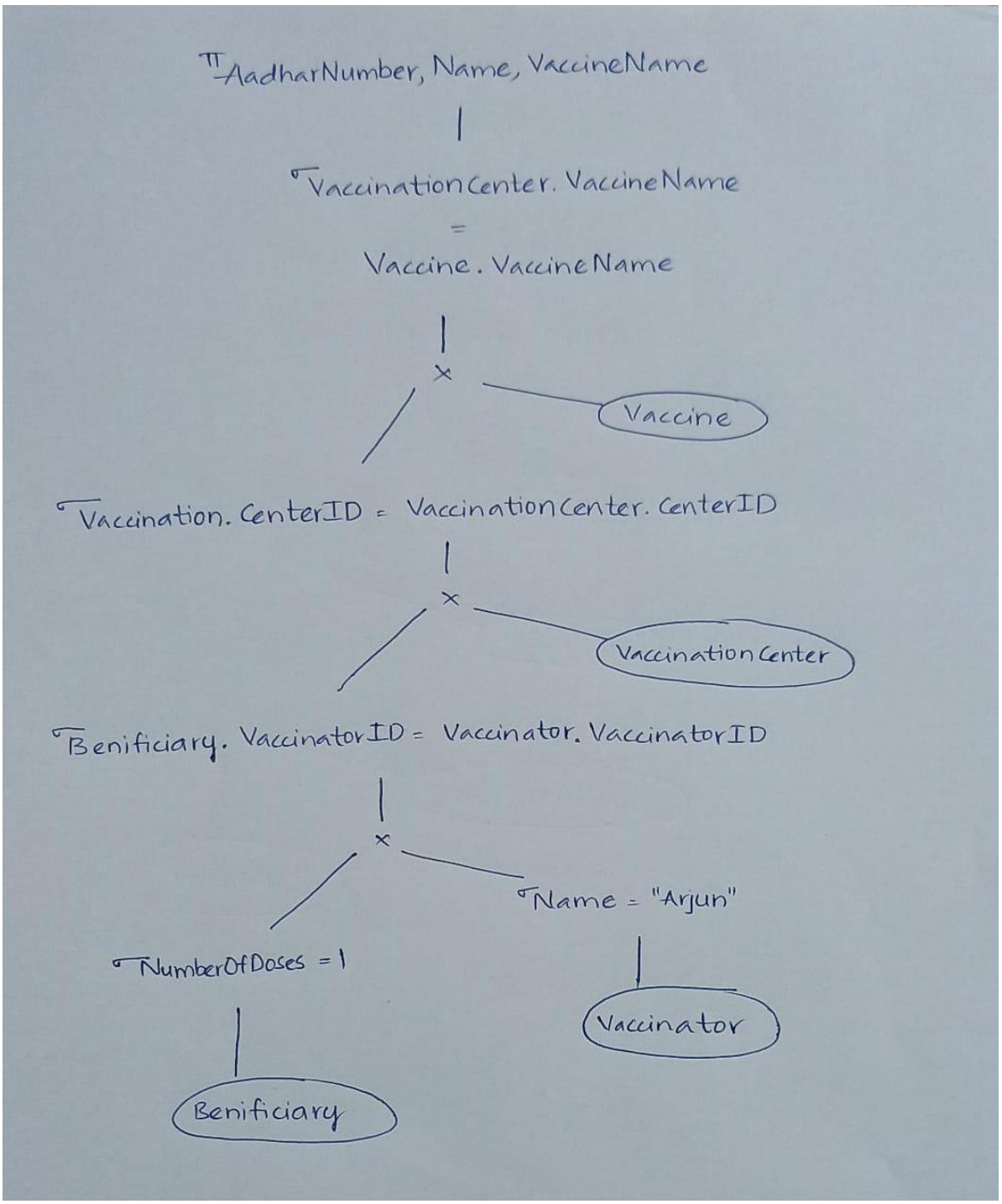
Get the aadharnumber, name, vaccinename for beneficiary who got vaccinated by Arjun and already taken his/her first dose of the vaccine.

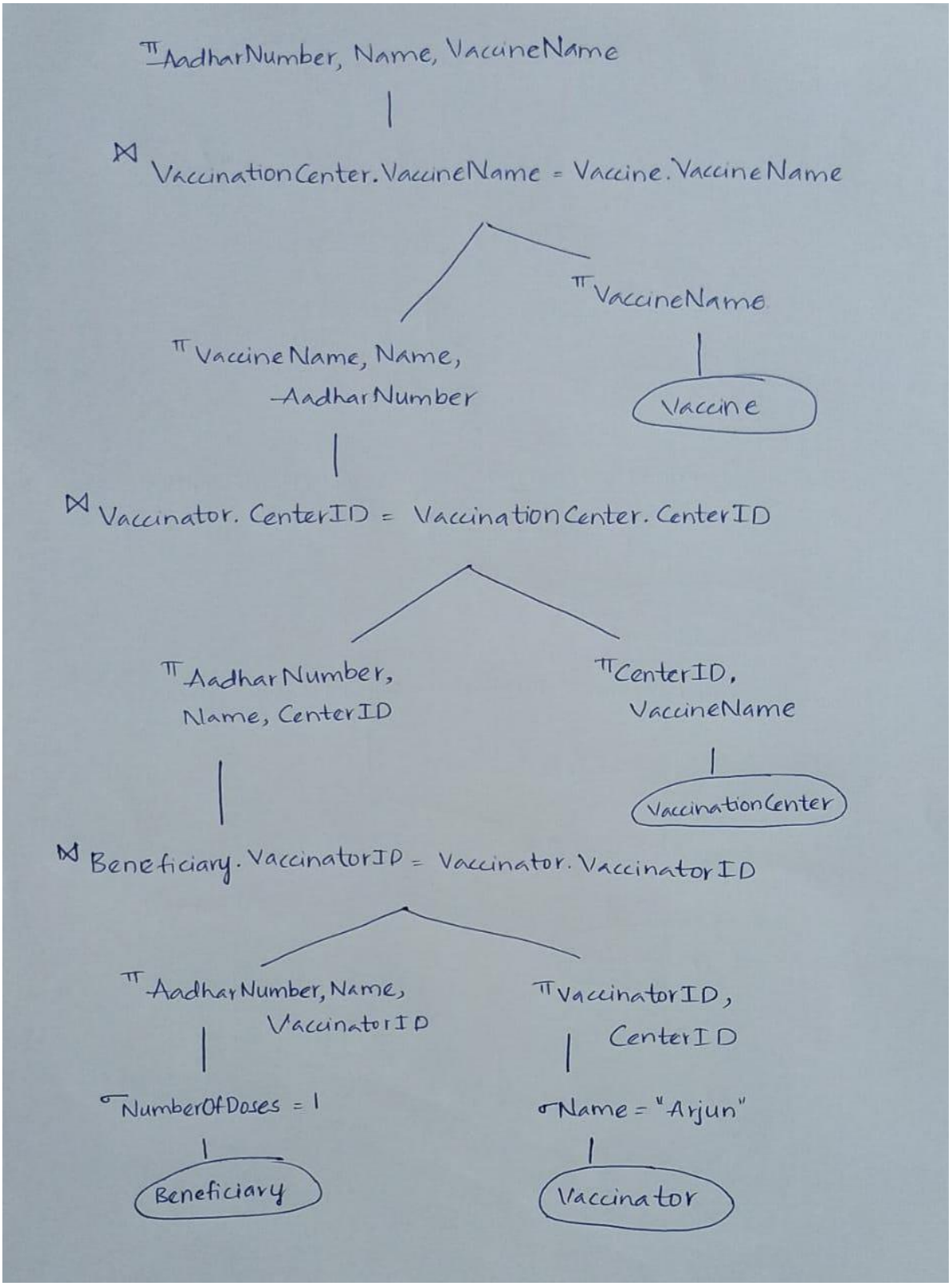
```
SELECT AadharNumber, Beneficiary.Name, Vaccine.VaccineName
FROM Beneficiary, Vaccinator, VaccinationCenter, Vaccine
WHERE Beneficiary.VaccinatorID = Vaccinator.VaccinatorID and
Vaccinator.CenterID = VaccinationCenter.CenterID and
VaccinationCenter.VaccineName = Vaccine.VaccineName and Vaccinator.Name =
'Arjun' and Beneficiary.NumberOfDosesTaken = 1;
```

Query tree:

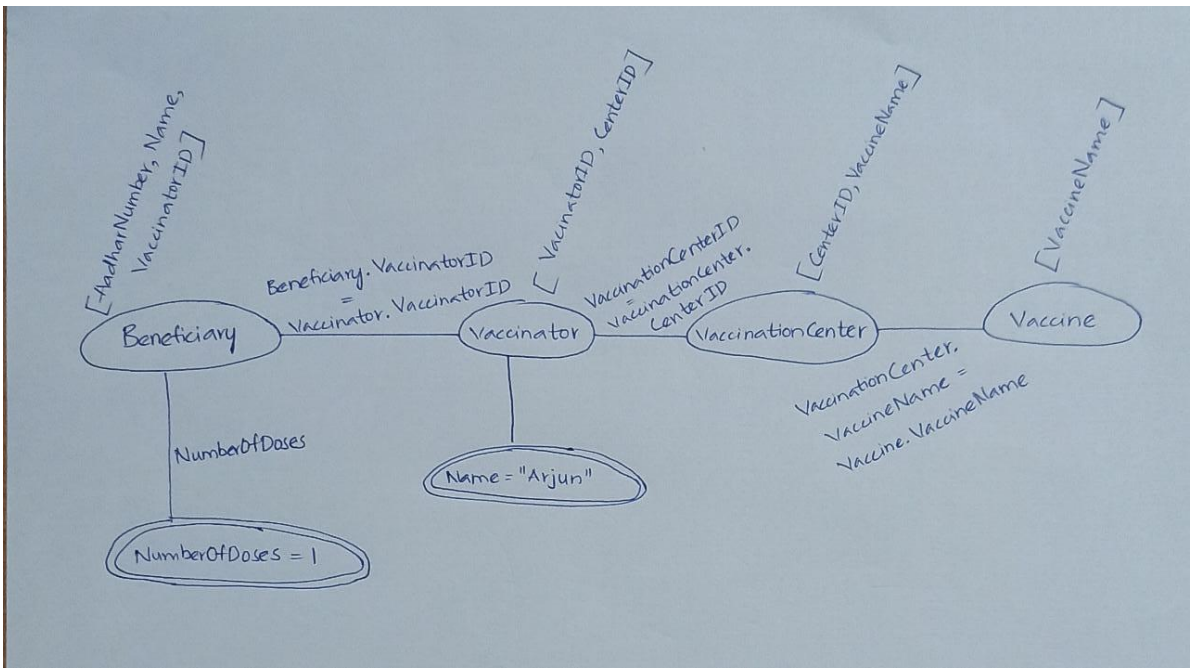

π AadharNumber, Benificiary.Name,
Vaccine.VaccineName
|
σ Benificiary.VaccinatorID
=
Vaccinator.VaccinatorID
|
×
Benificiary
×
Vaccinator
×
Vaccination Center
Vaccine


π AadharNumber, Benificiary.Name,
Vaccine.VaccineName
σ Benificiary.VacinatorID
=
Vaccinator.VaccinatorID
×
σ Benificiary.NumberofDosesTaken = 1
Benificiary
σ Vaccinator.CenterID
=
VaccinationCenter.CenterID
×
σ Name = "Arjun"
Vaccinator
σ VaccinationCenter.VaccineName
=
Vaccine.VaccineName
×
VaccinationCenter
Vaccine


π AadharNumber, Name, VaccineName
σ VaccinationCenter.VaccineName = Vaccine.VaccineName
×
Vaccine
σ Vaccination.CenterID = VaccinationCenter.CenterID
×
VaccinationCenter
σ Benificiary.VaccinatorID = Vaccinator.VaccinatorID
×
σ Name = "Arjun"
σ NumberOfDoses = 1
Vaccinator
Benificiary

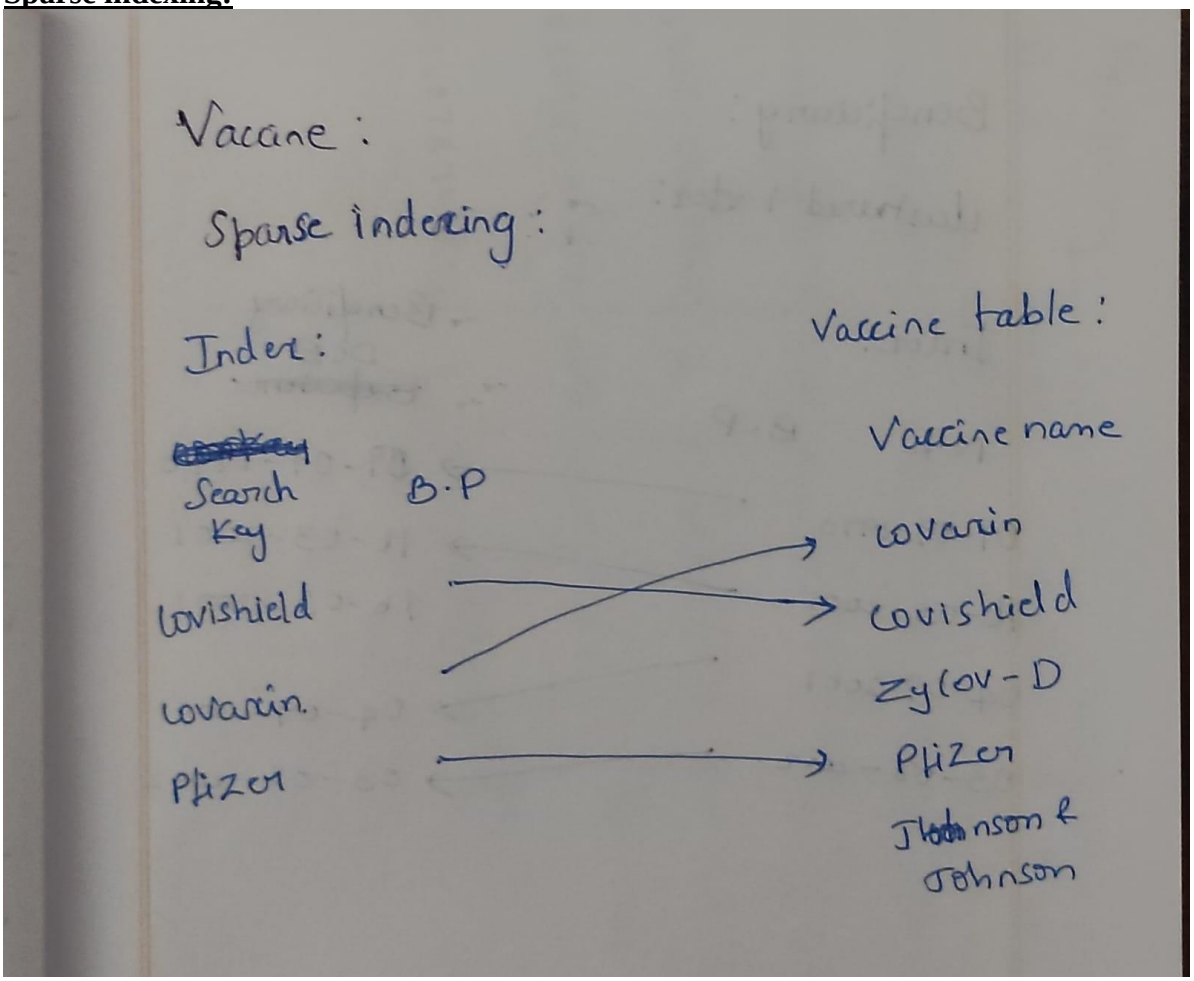

π AadharNumber, Name, VaccineName
⋈ VaccinationCenter.VaccineName = Vaccine.VaccineName
π VaccineName
π VaccineName, Name, AadharNumber
Vaccine
⋈ Vaccinator.CenterID = VaccinationCenter.CenterID
π AadharNumber, Name, CenterID
π CenterID, VaccineName
VaccinationCenter
⋈ Beneficiary.VaccinatorID = Vaccinator.VaccinatorID
π AadharNumber, Name, VaccinatorID
π VaccinatorID, CenterID
σ NumberOfDoses = 1
σ Name = "Arjun"
Beneficiary
Vaccinator

Query graph:

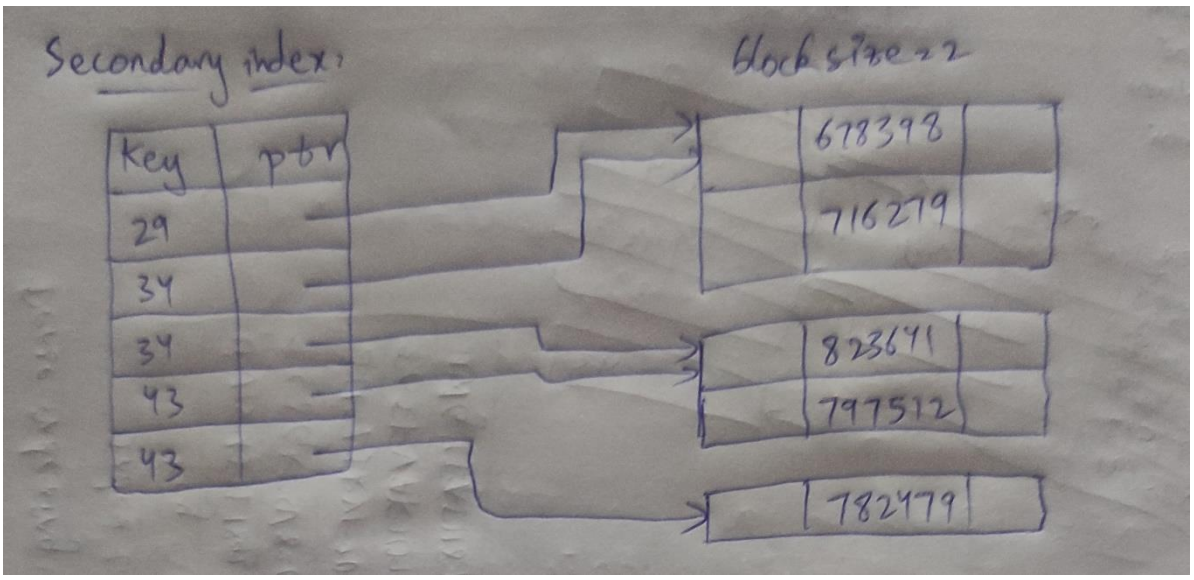


8. Module 7: Indexing

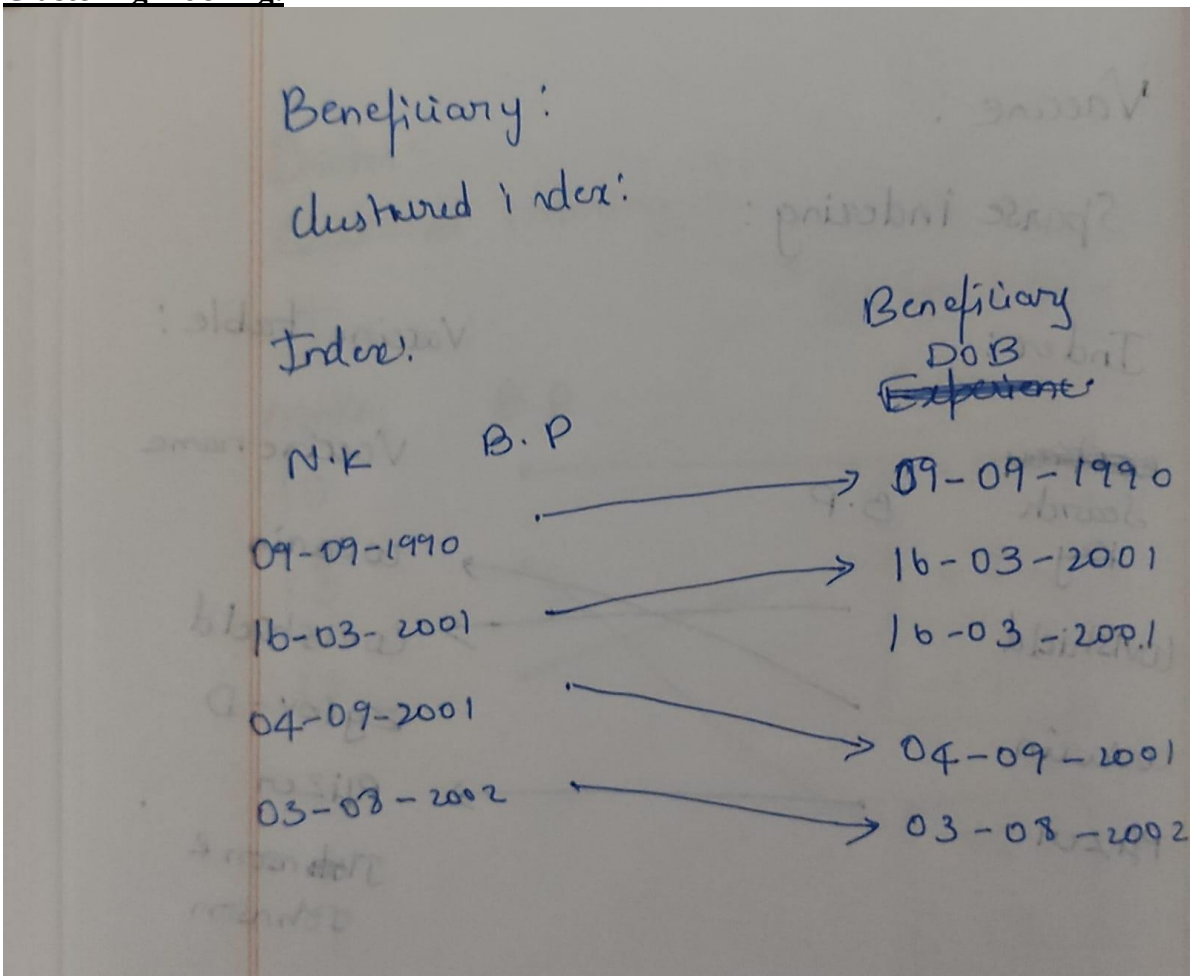
Sparse indexing:



Secondary indexing:



Clustering indexing:



Doctor:

Clustered indexing