

1. Requirements for Data Modeling Problems

1. You should identify insertion, update, and deletion anomalies in the sample rows of the big patient table shown in Table 1. You should identify one example of each type of anomaly. The combination of *VisitNo* and *ProvNo* is the only unique column(s) for the table.

Table 1: Sample Rows for the Big Patient Table

<u>VisitNo</u>	<u>VisitDate</u>	<u>PatNo</u>	<u>PatAge</u>	<u>PatCity</u>	<u>PatZip</u>	<u>ProvNo</u>	<u>ProvSpecialty</u>	<u>Diagnosis</u>
V10021	2/13/2018	P1	36	DENVER	80217	D1	INTERNIST	EAR INFECTION
V10021	2/13/2018	P1	36	DENVER	80217	D2	NURSE PRACTITIONER	INFLUENZA
V93030	2/20/2018	P3	17	ENGLEWOOD	80113	D2	NURSE PRACTITIONER	PREGNANCY
V82110	2/18/2018	P2	60	BOULDER	85932	D3	CARDIOLOGIST	MURMUR

Insertion Anomalies

One must know both VisitNo and ProvNo as both are Primary Keys

Deletion Anomalies

If the provider D2 is deleted the information regarding P1 and visit V10021 is lost

Update Anomalies

If the ProvSpeciality of D2 has to be changed, then 2 rows must be changed

2. Apply the simple BCNF procedure to define BCNF tables using the FD list Table 2. Show the result of each step in your analysis. For the final result, you should show the tables, columns, primary key of each table, foreign keys, and unique constraints. You do not need to provide CREATE TABLE statements.

Table 2: FDs for the Big Patient Table

PatNo \rightarrow PatAge
PatZip9 \rightarrow PatCity
VisitNo \rightarrow VisitDate
PatNo \rightarrow PatZip9
ProvNo \rightarrow ProvSpecialty
VisitNo \rightarrow PatNo
VisitNo, ProvNo \rightarrow Diagnosis
ProvNo \rightarrow ProvEmail
ProvEmail \rightarrow ProvNo

Functional Dependencies

PatNo \rightarrow PatAge, PatZip9

PatZip9 \rightarrow PatCity

VisitNo \rightarrow VisitDate, PatNo

ProvNo \rightarrow ProvSpeciality, ProvEmail

ProvEmail \rightarrow ProvNo

VisitNo, ProvNo \rightarrow Diagnosis

BCNF Tables

PatZip(PatZip9, PatCity)

Patient(PatNo, PatAge, PatZip9)

FOREIGN Key(PatZip9) REFERENCES PatZip

Visit(VisitNo, PatNo)

FOREIGN Key(PatNo) REFERENCES Patient

Provider(ProvNo, ProvSpeciality, ProvEmail)

UNIQUE(ProvEmail)

Diagnostics(VisitNo, ProvNo, Diagnosis)

FOREIGN Key(VisitNo) REFERENCES Visit

FOREIGN Key(ProvNo) REFERENCES Provider

3. You should determine if the *Student*, *Lender*, and *Institution* tables are in BCNF. In the *Lender* table, *LenderName* is unique. In the *Institution* table, *InstName* is unique. In the *Student* table, *StdEmail* is unique. The primary key of each table is underlined. The primary key of each table is underlined. You should explain your decision and modify the table design by splitting tables or adding constraints if necessary.

Student (StdNo, StdName, StdEmail, StdAddress, StdCity, StdState, StdZip)

Lender(LenderNo, LenderName)

Institution(InstNo, InstName, InstMascot)

Student (StdNo, StdName, StdEmail, StdAddress, StdCity, StdState, StdZip)

UNIQUE(StdEmail)

Reason: In the Student table, StdEmail is unique, hence both StdNo and StdEmail are determinants, it violates BCNF

Lender(LenderNo, LenderName)

UNIQUE(LenderName)

Reason: In the Lender table, LenderName is unique therefore it violates BCNF

Institution(InstNo, InstName, InstMascot)

UNIQUE(InstName)

Reason: In the Institution table, InstName is unique, it violates BCNF

4. For the big order database table in Table 3, you should list FDs with the column *OrdNo* as the determinant. For each FD, you should identify at least one pair of sample rows that falsify it or indicate that no falsification example exists for the FD. Remember that it takes two rows to falsify an FD in which the LHS is the same in both rows, but the RHS is different in both rows.

Table 3: Sample Rows for the Big Order Database Table

<u>OrdNo</u>	<u>ItemNo</u>	QtyOrd	CustNo	CustBal	CustDisc	ItemPrice	<u>OrdDate</u>
O1	I1	10	C1	100	0.10	10	1/15/2018
O1	I2	10	C1	100	0.10	20	1/15/2018
O2	I3	5	C2	200	0.05	30	1/16/2018
O2	I4	10	C2	200	0.05	40	1/16/2018
O3	I1	10	C1	100	0.10	10	1/17/2018

OrdNo→ItemNo **(1,2), (3,4)**

OrdNo→QtyOrd**(3,4)**

OrdNo→CustNo **NONE**

OrdNo→CustBal **NONE**

OrdNo→CustDisc **NONE**

OrdNo→ItemPrice **(1,2),(3,4)**

OrdNo→OrdDate **NONE**

