DBMS NORMALIZATION AND FD'S - MODULE 11

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

VisitNo	VisitDate	PatNo	PatAge	PatCity	PatZip	ProvNo	ProvSpecialty	Diagnosis
V10021	2/13/2015	P1	36	DENVER	80217	D1	INTERNIST	EAR INFECTION
V10021	2/13/2015	P1	36	DENVER	80217	D2	NURSE PRACTITIONER	INFLUENZA
V93030	2/20/2015	P3	17	ENGLEWOOD	80113	D2	NURSE PRACTITIONER	PREGNANCY
V82110	2/18/2015	P2	60	BOULDER	85932	D3	CARDIOLOGIST	MURMUR

Insertion Anomalies:

It's necessary to know VisitNo and ProvNo because the primary key is the combination of these two.

Deletion Anomalies:

If we just delete the provider of D2, we'll lose information about VisitNo V10021.

Updation Anomalies:

If we change ProvSpeciality where ProvNo is D2, two rows have to 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.

PatNo → PatAge
PatZip9 → PatCity
VisitNo → VisitDate
PatNo → PatZip9
ProvNo → ProvSpecialty
VisitNo → PatNo
VisitNo, ProvNo → Diagnosis
ProvNo → ProvEmail
ProvEmail → ProvNo

Table 2 - FD's for the Big Patient Table

Ans)

List of FDs

- PatNo -> PatAge, PatZip9
- PatZip9 -> PatCity
- VisitNo -> VisitDate,PatNo
- ProvNo -> ProvSpecialty, ProvEmail
- VisitNo , ProvNo -> Diagnosis
- ProvEmail -> ProvNo (Will be merged with 4th FD)

BCNF Tables

Table 1(**PatNo**, PatAge, PatZip9)

FOREIGN KEY(PatZip9) REFERENCES **Table1-1**

Table 1.1(**PatZip**, PatCity)

Table 2(**VisitNo**, PatNo, VisitDate)

FOREIGN KEY(PatNo) REFERENCES **Table 1**

Table 3(**ProvNo**, ProvSpecialty, ProvEmail)

UNIQUE(ProvEmail)

Table 4(ProvNo, VisitNo, Diagnosis)

FOREIGN KEY (ProvNo) REFERENCES **Table 3**

FOREIGN KEY(VisitNo) REFERENCES **Table 2**

---

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. 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)

Ans)

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

UNIQUE(StdEmail)

Reason: Both StdNo and StdEmail are determinants(StdEmail is unique) and hence BCNF is violated

Lender(LenderNo, LenderName)

UNIQUE(LenderName)

Reason: In the Lender table, LenderName is unique,BCNF is violated

Institution(InstNo, InstName, InstMascot)

UNIQUE(InstName)

Reason: In the Institution table, InstName is unique, BCNF is violated

---

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

OrdNo	ItemNo	QtyOrd	CustNo	CustBal	CustDisc	ItemPrice	OrdDate
O1	I1	10	C1	100	0.10	10	1/15/2014
O1	I2	10	C1	100	0.10	20	1/15/2014
O2	I3	5	C2	200	0.05	30	1/16/2014
O2	I4	10	C2	200	0.05	40	1/16/2014
O3	I1	10	C1	100	0.10	10	1/17/2014

Table 3: Sample Rows for the Big Order Database Table

Ans)

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**
