

Assignment for Module 11

The assignment for Module 11 involves problems for falsifying functional dependencies, converting ERDs to table designs, and applying the rules of normalization.

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>	VisitDate	PatNo	PatAge	PatCity	PatZip	<u>ProvNo</u>	ProvSpecialty	Diagnosis
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 anomaly: When we just want to add a patient to the database, we also need to add diagnosis and visit date.

Update anomaly: When we need to update the PatAge where PatNo = 1, we have to update rows 1 and 2.

Deletion anomaly: If we delete the ProvNo D2 with VisitNo V10021, it also deletes the data about patient P1 with the same VisitNo.

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 -> PatAge

PatZip -> PatCity

VisitNo -> VisitDate

PatNo -> PatZip

ProvNo -> ProvSpecialty

VisitNo -> PatNo

VisitNo, ProvNo -> Diagnosis

ProvNo -> ProvEmail

ProvEmail -> ProvNo

1. Group FDs with the same determinant (LHS)

PatNo -> PatAge, PatZip

PatZip -> PatCity

VisitNo -> VisitDate, PatNo

ProvNo -> ProvSpecialty, ProvEmail VisitNo

ProvNo -> Diagnosis

ProvEmail -> ProvNo

2. Create Tables using Determinant as primary key, adding foreign keys.

Patient(**PatNo**, PatAge, *PatZip*) FOREIGN KEY (*PatZip*) REFERENCES Zip

Zip(**PatZip**, PatCity)

Visit(**VisitNo**, VisitDate, *PatNo*) FOREIGN KEY (*PatNo*) REFERENCES Patient

Provider(**ProvNo**, ProvSpecialty, *ProvEmail*) FOREIGN KEY (*ProvEmail*)

REFERENCES ProviderEmail

Appointment(**VisitNo**, **ProvNo**, Diagnosis) FOREIGN KEY (*VisitNo*) REFERENCES

Visit FOREIGN KEY (*ProvNo*) REFERENCES Provider

ProviderEmail(**ProvEmail**, *ProvNo*) FOREIGN KEY (*ProvNo*) REFERENCES Provider

3. Merge tables if one contains columns that are a subset of another table

Patient(**PatNo**, PatAge, *PatZip*) FOREIGN KEY (*PatZip*) REFERENCES Zip

Zip(**PatZip**, PatCity)

Visit(**VisitNo**, VisitDate, *PatNo*) FOREIGN KEY (*PatNo*) REFERENCES Patient

Provider(**ProvNo**, ProvSpecialty, ProvEmail) UNIQUE ProviderEmail

Appointment(**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 table: The dependencies between StdNo and StdEmail violates BCNF. Both StdNo and StdEmail are determinants.

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

Lender table:

Lender(LenderNo, LenderName) UNIQUE(LenderName)

Institution table: The dependencies between InstNo and InstName violate BCNF

Institution(InstNo, InstName, InstMascot) UNIQUE(InstName)

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	OrdDate
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

Functional Dependencies Falsifying Rows

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