Assignment for Relational Database Design

The assignment 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

VisitNo	VisitDate	PatNo	PatAge	PatCity	PatZip	ProvNo	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

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

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)

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	1/15/2018
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

5. Find the canonical cover for the following :-

   $R = \{A,B,C,D,E,F,G,H\}$

   $F = \{AC \rightarrow G, D \rightarrow EG, BC \rightarrow D, CG \rightarrow BD, ACD \rightarrow B, CE \rightarrow AG\}$.

6. Suppose a relational schema R(w x y z), and set of functional dependency as following :

   $F : \{ x \rightarrow w, \ Wz \rightarrow xy, \ y \rightarrow wxz \}$

   Find the canonical cover Fc (Minimal set of functional dependency).