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

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

Insertion

- A new VisitNo cannot be inserted unless a ProvNo is known, as the primary key is the combination of VisitNo and ProvNo

Update

- To update the PatCity of VisitNo V10021, two rows must be changed.

Deletion

- Deleting the row of VisitNo V82110 and ProvNo D3, also removes patient P2 and ProvSpecialty from the database.

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

Step 1: Arrange the remaining FDs into groups by determinant

PatNo → PatAge, PatZip9

PatZip9 → PatCity

VisitNo → VisitDate, PatNo

ProvNo → ProvSpecialty, ProvEmail

VisitNo, ProvNo → Diagnosis

ProvEmail → ProvNo

Step 2: For each FD group, make a table with the determinant as the primary key. In the table list, the primary keys are underlined

Patient (PatNo, PatAge, PatZip9)

FOREIGN KEY (PatZip9) REFERENCES PatientZip

PatientZip (PatZip9, PatCity)

Visit(VisitNo, VisitDate, PatNo)

FOREIGN KEY (PatNo) REFERENCES Patient

Provider (ProvNo, ProvSpecialty, ProvEmail)

FOREIGN KEY (ProvEmail) REFERENCE Provider

Diagnosis(VisitNo, ProvNo, Diagnosis)

FOREIGN KEY (VisitNo) REFERENCES Visit

FOREIGN KEY (ProvNo) REFERENCES Provider

ProviderEmail (ProvEmail, ProvNo)

FOREIGN KEY (ProvNo) REFERENCES Provider

Step 3: Merge tables with the same columns and add UNIQUE constraints if necessary.

Patient (PatNo, PatAge, PatZip9)

FOREIGN KEY (PatZip9) REFERENCES PatientZip

PatientZip (PatZip9, PatCity)

Visit(VisitNo, VisitDate, PatNo)

FOREIGN KEY (PatNo) REFERENCES Patient

Provider (ProvNo, ProvSpecialty, ProvEmail)

FOREIGN KEY (ProvEmail) REFERENCE Provider

UNIQUE(ProvEmail)

Diagnosis(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)

Answer:

- The student table is not in BCNF because StdZip → StdAddress, StdCity, StdState
- Split the Student table into 2 tables, with StdAddress, StdCity, StdState, StdZip as attributes, and StdZip as primary key in the new StudentZip table and foreign key in Student table.
- A UNIQUE constraint for StdEmail as StdEmail → StdNo

Lender(LenderNo, LenderName)

- A UNIQUE constraint for LenderName as LenderName → LenderNo

Institution(InstNo, InstName, InstMascot)

- A UNIQUE constraint for InstName as InstName → InstNo

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

FD	Falsification
OrdNo → ItemNo	(1,2), (3,4)
OrdNo → QtyOrd	(3,4)
OrdNo → CustNo	None
OrdNo → CustBal	None
CustNo → CustDisc	None
CustNo → ItemPrice	(1,2), (3,4)
CustNo → OrdDate	None

2. Submission Requirements

The submission requirements involve evidence that you use the conversion rules for the ERD in each problem. You should label the problems in a document so that the grader can easily match your work to the specified problems. *** Add details about submission ***