

Problem 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

Solution:

Step 1: Arrange the FDs into groups by determinant

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

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, ProvSpeciality, ProvEmail)
FOREIGN KEY (ProvEmail) REFERENCES (ProviderEmail)

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

Diagnosis (VisitNo, ProvNo, Diagnosis)
FOREIGN KEY (VisitNo) REFERENCES (Visit)
FOREIGN KEY (ProvNo) REFERENCES (Provider)

Step 3: Merge tables with the same columns. The Provider and ProviderEmail tables are merged. UNIQUE constraint is added for ProvEmail.

Patient (PatNo, PatAge, PatZip9)
FOREIGN KEY (PatZip9) REFERENCES (PatientZip)

PatientZip (PatZip9, PatCity)

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

Provider (ProvNo, ProvSpeciality, ProvEmail)
UNIQUE ProvEmail

Diagnosis (VisitNo, ProvNo, Diagnosis)
FOREIGN KEY (VisitNo) REFERENCES (Visit)
FOREIGN KEY (ProvNo) REFERENCES (Provider)