Eric Blasko

Dr. Vu

CSE 572

May 30, 2019

Homework 14.15

14.15 The table shown in Figure 14.19 lists sample dentist/patient appointment data. A patient is given an appointment at a specific time and date with a dentist located at a particular surgery. On each day of patient appointments, a dentist is allocated to a specific surgery for that day.

(a) The table shown in Figure 14.19 is susceptible to update anomalies. Provide examples of insertion, deletion, and update anomalies.

(b) Identify the functional dependencies represented by the attributes shown in the table of Figure 14.19. State any assumptions you make about the data and the attributes shown in this table.

(c) Describe and illustrate the process of normalizing the table shown in Figure 14.19 to 3NF relations. Identify the primary, alternate, and foreign keys in your 3NF relations.

staffNo	dentistName	patNo	patName	appointment date	appointment time	surgeryNo
S1011	Tony Smith	P100	Gillian White	12-Sep-13	10.00	S15
S1011	Tony Smith	P105	Jill Bell	12-Sep-13	12.00	S15
S1024	Helen Pearson	P108	Ian MacKay	12-Sep-13	10.00	S10
S1024	Helen Pearson	P108	Ian MacKay	14-Sep-13	14.00	S10
S1032	Robin Plevin	P105	Jill Bell	14-Sep-13	16.30	S15
S1032	Robin Plevin	P110	John Walker	15-Sep-13	18.00	S13

Figure 14.19 Table displaying sample dentist/patient appointment data.

A. Anomalies
   - Insert anomaly: If a new patient data needs to be inserted which has not given any appointment with the dentist, staffNo will be null which violates entity integrity constraint as primary key cannot be null.
   - Deletion anomaly: If a dentist leaves the job and his data needs to be deleted from the table, the only patient who was getting treatment from this dentist will also get deleted.
   - Updating anomaly: If a dentist gets married and her surname is changed, all the concerned records of her appointments need to be updated. If this is not done, inconsistent data exist in the tables.

B. Functional dependencies:
   - Assumptions
     i. Assume that a patient is registered at only one surgery.
     ii. Assume that a patient may have more than one appointment on a given day
     iii. In some cases of this relation, appointment date and time values are used separately so the column “appointment date time” is represented as two attributes “appDate” and “appTime”.
   - Functional Dependencies:

i. Fd1 = staffNo, appDate, appTime → patientNo, surgeryNo
ii. Fd2 = staffNo → dentistName
iii. Fd3 = patNo → patName,surgeryNo
iv. Fd4 = staffNo, appDate → surgeryNo
v. Fd5 = staffNo, appDate, appTime → staffNo, dentistName

C.

1NF

The relation after splitting column "appointment date time" in to two attributes "appDate" and "appTime". There are no repeating groups in the given relation so the relation is in 1NF.

Dentist_patient_info

staffNo	dentistName	patNo	patName	appDate	appTime	surgeryNo

PK: staffNo, appDate, appTime

2NF

Second normal form stats that there shouldn't be any partial functional dependency's in the relation. The functional dependency statements 'fd2' and 'fd4' violates the rules of 2NF. New relation becomes.

Appointment_details

staffNo	appDate	appTime	patNo	patName

PK: staffNo, appDate, appTime

Surgery_details

staffNo	appDate	surgeryNo

PK: staffNo, appDate
FK: staffNo

Dentist_details

staffNo	dentistName

PK:staffNo

3NF

Third Normal Form states that there shouldn't be any transitive dependency in the relation. In the relation "appointment_details', non-key attribute "patName" is functionally dependent on another non-key attribute "patNo". So the relation "appointment_details" is decomposed in to two relations

Appointment_details

staffNo	appDate	appTime	patNo

PK: staffNo, appDate, appTime
FK: staffNo, patNo

patient_details

patNo	patName

PK: patNo
Alt key: patName

Surgery_details

staffNo	appDate	surgeryNo

PK: staffNo, appDate
FK: staffNo

Dentist_details

staffNo	dentistName

PK: staffNo