CSCI 466 Assignment 3 (Fall 2023)

Normalization (50 pts)

The Task

We discussed in class that a relational database designed in a poor way will allow for anomalies to occur. This is undesirable, so we use normalization to prevent them. Several relations are provided below, along with their functional dependencies. Answer the questions provided and fix what is broken. Perform only the current step for each question, i.e. when fixing First Normal Form (1NF), fix only 1NF, leaving the 2NF and 3NF violations untouched until the question that asks about them.

The Questions

For each of the below, part (b) refers to the results of part (a), and part (c) refers to the results of part (b) – any changes made during the previous steps should be considered in the steps that follow. Each of these is worth 10 points for a total of 50.

1. StockExchange(Company, Symbol, HQ, Date, ClosePrice)
   Functional Dependencies:
   - Symbol, Date ⟶ Company, HQ, ClosePrice
   - Symbol ⟶ Company, HQ
   - Symbol ⟶ HQ

   (a) Is this relation in 1NF? If not, explain why not, then make the necessary changes to fix it.
   (b) Is this relation in 2NF? If not, explain why not, then make the necessary changes to fix it.
   (c) Is this relation in 3NF? If not, explain why not, then make the necessary changes to fix it.

2. Company(EmpID, EmpName, EmpAddr, (ProjID, ProjName, MgrID, MgrName, HoursWorked))
   Functional Dependencies:
   - EmpID ⟶ EmpName, EmpAddr
   - ProjID ⟶ ProjName, MgrID, MgrName
   - EmpID, ProjID ⟶ HoursWorked
   - MgrID ⟶ MgrName

   (a) Is this relation in 1NF? If not, explain why not, then make the necessary changes to fix it.
   (b) Is this relation in 2NF? If not, explain why not, then make the necessary changes to fix it.
   (c) Is this relation in 3NF? If not, explain why not, then make the necessary changes to fix it.

3. Pharmacy(patient_id, patient_name, address, (Rx_num, trademark_name, generic_name, (filldate, num_refills_left), num_refills))
   Functional Dependencies:
   - patient_id ⟶ patient_name, address
   - patient_id, Rx_num ⟶ trademark_name, generic_name
   - Rx_num ⟶ num_refills
   - Rx_num, filldate ⟶ num_refills_left

   (a) Is this relation in 1NF? If not, explain why not, then make the necessary changes to fix it.
   (b) Is this relation in 2NF? If not, explain why not, then make the necessary changes to fix it.
   (c) Is this relation in 3NF? If not, explain why not, then make the necessary changes to fix it.

4. R(A, B, C, D, E, F, G, H)
   Functional Dependencies:
   - A ⟶ D, E
   - C ⟶ G
   - A, C ⟶ H, F

   (a) Is this relation in 1NF? If not, explain why not, then make the necessary changes to fix it.
   (b) Is this relation in 2NF? If not, explain why not, then make the necessary changes to fix it.
   (c) Is this relation in 3NF? If not, explain why not, then make the necessary changes to fix it.

5. Property(id, county, lotNum, lotArea, price, taxRate, (datePaid, amount))
   Functional Dependencies:
   - id ⟶ county, lotNum, lotArea, price, taxRate
   - lotArea ⟶ price
   - county ⟶ taxRate

- id, datePaid ⟶ amount

(a) Is this relation in 1NF? If not, explain why not, then make the necessary changes to fix it.
(b) Is this relation in 2NF? If not, explain why not, then make the necessary changes to fix it.
(c) Is this relation in 3NF? If not, explain why not, then make the necessary changes to fix it.

What to turn in?

Answers to the questions should be submitted via Blackboard as a PDF with your name and section at the top of each page.