ISTE-230 Introduction to Database & Data Modeling

## Practice Exercise # 6 – Normalization through BCNF

**Name: \_Korben Reehill\_**

**All assignments will be graded with regard to the standards that were discussed in class, which can be found in the Standards Content area.**

**Problem #1**

Given the original relation (PUPPY) and functional dependencies, normalize the original and all resulting relations to BCNF. Be sure to use proper relational notation: RELATION(pkattr, attribute, *fkattr*). Include reference statements for foreign keys.

PUPPY(puppyID, puppyName, kennelNumber, kennelLocation)

Functional Dependencies:

puppyID 🡺 puppyName, kennelNumber, kennelLocation

kennelNumber 🡺 kennelLocation

**YOUR ANSWER (Final set of relations normalized to BCNF):**

PUPPY(puppyID, puppyName, *kennelNumber*)

KENNEL(kennelNumber) must exist in PUPPY(*kennelNumber)*

KENNEL(kennelNumber, kennelLocation)

**Problem #2**

Given the original relation (VEHICLE) and functional dependencies, normalize the original and all resulting relations to BCNF. Be sure to use proper relational notation: RELATION(pkattr, attribute, *fkattr*). Include reference statements for foreign keys.

VEHICLE

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| vin | make | model | year | ownerID | owner |
| 111abc | Toyota | Corrolla | 1988 | 111223333 | Joe Smith |
| 223ahv | Ford | Windstar | 1998 | 222334444 | Bill Gates |
| 332amz | GM | GMC | 1995 | 333445555 | Tom Green |
| 876grd | Subarau | Outback | 2000 | 987654321 | Bob Jones |

VEHICLE(vin, make, model, year, ownerID, owner)

Functional Dependencies:

vin 🡺 make, model, year, ownerID, owner

ownerID 🡺 owner

**YOUR ANSWER (Final set of relations normalized to BCNF):**

VEHICLE(vin, make, model, year, *ownerID*)

OWNER(ownerID) must exist in VEHICLE(*ownerID*)

OWNER(ownerID, owner)

**Problem #3**

For the relation below, determine the *highest* normal form the relation is in, the reason, and if necessary normalize through BCNF.

Relation: Q2( a, b, c, d )

Functional Dependencies:

a, b 🡪 c, d

c, d 🡪 a, b

**YOUR ANSWER:**

This relation is in BCNF**.** We can see that 1NF is met through no repeated or redundant data, and 2NF is met since there is no partial dependencies. 3NF is questionable at first glance, since the attribute pairs of (a, b) and (c, d) are mutually dependent on each other, creating a *kind* of transitive dependency, however, this is actually what BCNF ***wants*** at a definitional level – each attribute – simple or composite – should be a candidate key for the relation, which is exactly what we have here. This relation, from a representational standpoint, doesn’t change much if c, d is the primary key and a, b are other attributes, but still a candidate key.

**Problem #4**

Given the original relation (A) and functional dependencies, normalize the original and all resulting relations to BCNF. Be sure to use proper relational notation: RELATION(pkattr, attribute, *fkattr*). Include reference statements for foreign keys.

A(1, 2, 3, 4, 5, 6, 7, 8, 9)

Functional Dependencies:

1, 2, 3 🡪 4, 5, 6, 7, 8, 9 (based on PK choice for a)

1🡪 4

4 🡪 1

2🡪 6, 7, 8, 9

6,7 🡪 8,9

**YOUR ANSWER (Final set of relations normalized to BCNF):**

A(*1*, *2*, 3, 5)

B(2, *6*, *7*)

C(*6*, *7*, 8, 9)

D(*1*, 4)