**数据库系统课程第六次作业**

**Database System Concepts Homework**

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chapter 8|Relational Database Design

**8.29** Consider the following set *F* of functional dependencies on the relation schema ***r***(A, B, C, D, E, F):

A → BCD

BC → DE

B → D

D → A

d. Give a 3NF decomposition of ***r*** based on the canonical cover.

e. Give a BCNF decomposition of ***r*** using the original set of functional

dependencies.

f. Can you get the same BCNF decomposition of ***r*** as above, using the

canonical cover?

**Answer:**

d.

Since B→D

in BC→DE, D is redundant and in A→BCD, D is unnecessary.

Since B→D, D→A, A→BC

B→C

Since B→C, BC→E

B→E

We have:

A→B, B→C, B→D, B→E, D→A

The canonical cover of F is {A→B, B→CDE, D→A}.

R1={AB}, R2={BCDE}, R3={DA}, R4={AF}

is a 3NF decomposition of ***r***.

e.

One of candidate keys of ***r*** is {AF}.

Since A→BCD and A is not super key,

Since A→E in F+ and A is not super key,

result now is BCNF decomposition.

f.

We can’t get the same BCNF decomposition by using canonical cover directly, but can use canonical cover infer the origin functional dependencies.

**2、**Database design II: Consider a relation schema R(A,B,C,D,E) and its functional dependencies, F={ A→C, C→A, B→AC, D→AC }, complete the following questions:

* a) Compute (AD)+
* b) Compute the candidate keys for R.
* c) Compute the canonical cover *Fc*.
* d) Give a lossless decomposition into BCNF of schema R.

**Answer:**

a)

result is {AD}.

since A→C

result is {ACD}.

(AD) + is ACD

b)

Since none of all attributes can derive B, D in F, BD must be included in super key. Because of B→AC, BD→ABCD, BD is a super key of R.

BD is the smallest super key, so BD is a candidate key for R.

c)

Since A→C

C is extraneous in B→AC, D→AC

set is now{A→C, C→A, B→A, D→A}

d)

The candidate key is {BD}.

In B→AC, B is not a super key,

To have functional dependencies D→AC

Now in result, {A→C, C→A} in both and . {B→AC} in , D→AC in . The result is a lossless decomposition.

**3、**Suppose that we have a schema ***R(A, B, C, D, E)***. You are given the following dependencies:

A → B

BC → E

ED → A

1. List all candidate keys for R.
2. Is *R* in 3NF? If it is, justify your answer. If not, produce a decomposition of *R* into 3NF.
3. Is *R* in BCNF? If it is, justify your answer. If not, produce a decomposition of *R* into BCNF.
4. Does your decomposition in (c) preserve dependencies? Is there any BCNF decomposition of R that can preserve dependencies? Justify your answers.

**Answer:**

1.

Candidate keys are {ACD}, {BCD} and {CDE}.

2.

R is 3NF because all attributes is main attribute.

3.

check A→B, since A is not a super key, decomposes R into

F={A→B}

F={ED→A}

check ED→A, since ED is not a super key, decomposes R into

F={A→B}

F={ED→A}

4.

My decomposition in 3. doesn’t preserve dependencies. It lost the dependency BC→ E, justify it to

F={A→B}

F={ED→A}

F={BC→E}