

Course Name: **A Level (1st Sem)**

Subject : **Introduction to DBMS**

Topic: **DB Normalization – Exercise Practices on 3NF (Part 9)**

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Database Normalization – Exercise Practices on 3NF

Q.1 Suppose a relational schema R (A B C D E) and set of functional dependencies

F: { A $\rightarrow$ B
B $\rightarrow$ E
C $\rightarrow$ D }

Check out that relation is in 3NF or not? If not decompose it in 3NF.

Solution1:

Firstly find the candidate key in the relation:

$(AC)^+ = ABCDE$

AC is the candidate key, because closure of AC has all the attributes of R.

Prime attributes: AC

Non prime attributes: BDE

A relation is said to be 3NF, if it holds at least one of the following for every non trivial functional dependency $\alpha \rightarrow \beta$:

- α is super key.
- β is prime attribute.

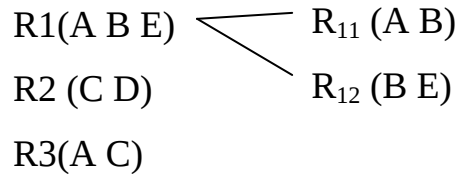
A $\rightarrow$ B -- Neither A is super key, nor B is prime attribute.

B $\rightarrow$ E -- Neither B is not super key, nor E is prime attribute.

C $\rightarrow$ D -- Neither C is not super key, nor D is prime attribute.

So, the relation is not in 3NF as it is not following the rules of 3NF.

Therefore, R(ABCDE) needs to be divided into following:



Now R_{11} , R_{12} , R_2 , R_3 are in 3NF.

Q.2 Suppose a relational schema R (A B C D E F G H I) and set of functional dependencies

F: { $AB \rightarrow C$,
 $AD \rightarrow GH$,
 $BD \rightarrow EF$,
 $A \rightarrow I$,
 $H \rightarrow J$ }

Check out that relation is in 3NF or not? If not decompose it in 3NF.

Solution 2:

Firstly find the candidate key in the relation:

$(ABD)^+ = A B C D E F G H I$

ABD is the candidate key, because closure of ABD has all the attributes of R.

Prime attributes: A B D

Non prime attributes: C E F G H I

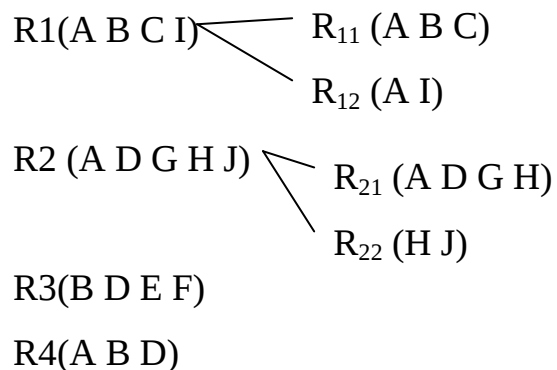
A relation is said to be 3NF, if it holds at least one of the following for every non trivial functional dependency $\alpha \rightarrow \beta$:

- α is super key.
- β is prime attribute.

- $AB \rightarrow C$ -- Neither AB is super key, nor C is prime attribute.
 $AD \rightarrow GH$ -- Neither AD is not super key, nor GH is prime attribute.
 $BD \rightarrow EF$ -- Neither BD is not super key, nor EF is prime attribute.
 $A \rightarrow I$ -- Neither A is not super key, nor I is prime attribute.
 $H \rightarrow J$ -- Neither H is not super key, nor J is prime attribute.

So, the relation is not in 3NF as it is not following the rules of 3NF.

Therefore, R(ABCDE) needs to be divided into following:



Now R_{11} , R_{12} , R_{21} , R_{22} , R_3 , R_4 are in 3NF.

Exercise:

1. Suppose R (A B C D E F G H I J) and set of FDs

$F : \{ AB \rightarrow C ,$
 $A \rightarrow DE,$
 $B \rightarrow F,$
 $F \rightarrow GH,$
 $D \rightarrow IJ \}$

The above table is normalized up to 3NF or not? If not, decompose it in 3NF.

