

Course Name: A Level (1st Sem)

Subject : Introduction to DBMS

Topic: DB Normalization – Third Normal Form (Part 7)

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Database Normalization – Third Normal Form (3NF)

Third Normal Form (3NF)

A relation (table) is said to be in 3NF:

- If it is in 2NF.
- There must be no transitive functional dependency for non prime attributes.

Transitive FD :

“If non prime attribute is dependent on another non prime attribute then it is called transitive functional dependency.”

In other words,

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.

Suppose a relation schema R (A B C D) and set of functional dependency

F: $AB \rightarrow C$,

$C \rightarrow D$

The candidate key in above relation is AB [since $AB^+ = ABCD$]

So, **Prime** Attributes: AB [These attributes are in candidate key.]

Non prime attributes : CD [These attributes are not part of candidate key.]

Now, the functional dependency { $AB \rightarrow C, C \rightarrow D$ } are following the rules of 2NF because there is no partial dependency (Non prime attribute is not dependent on attribute that is part of the candidate key).

Hence above relation is in 2NF.

But, relation is not following the rule of 3NF, because of functional dependency $C \rightarrow D$

It is the case of transitive dependency in $C \rightarrow D$ [**Non prime attribute is dependent on another non prime attribute.**]

To convert it into 3NF, it needs to be divided into following relation:

R1 (ABC) $[AB \rightarrow C]$

R2 (CD) $[C \rightarrow D]$

The FD which has transitive dependency, the separate table is created for it to remove the transitive dependency.

Now the relation R1 (ABC), R2 (AB) are following the rules defined in 3NF.

Exercise:

1. What are the rules defined in 3NF?

