**3NF (Normalization)**

A given relation is said to be in its third normal form when it’s in 2NF but has no transitive partial dependency. Meaning, when no transitive dependency exists for the attributes that are non-prime, then the relation can be said to be in 3NF.

In simpler words,

*In a relation that is in 1NF or 2NF, when none of the non-primary key attributes transitively depend on their primary keys, then we can say that the relation is in the third normal form of 3NF.*

Look at the table given below for the relation CANDIDATE:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CAND\_NO** | **CAND\_NAME** | **CAND\_STATE** | **CAND\_COUNTRY** | **CAND\_AGE** |
| 1 | Farooque | Mirpur Khas | Pakistan | 18 |
| 2 | Talha | Tando Allahyar | Pakistan | 17 |
| 3 | Arbab | Hyderabad | Pakistan | 19 |

**1.**Decompose the following table into 3NF:

CANDIDATE\_DETAIL Table:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CAND\_ID** | **CAND\_NAME** | **CAND\_ZIP** | **CAND\_CITY** | **CAND\_STATE** |
| 262 | Jake | 201010 | Noida | UP |
| 353 | Rosa | 02228 | Boston | US |
| 434 | Charles | 60007 | Chicago | US |
| 545 | Gina 0 | 6389 | Norwich | UK |
| 626 | Terry | 462007 | Bhopal | MP |

CANDIDATE Table:

|  |  |  |
| --- | --- | --- |
| **CAND\_ID** | **CAND\_NAME** | **CAND\_ZIP** |
| 262 | Jake | 201010 |
| 353 | Rosa | 02228 |
| 434 | Charles | 60007 |
| 545 | Gina | 06389 |
| 626 | Terry | 462007 |

CANDIDATE\_ZIP Table:

|  |  |  |
| --- | --- | --- |
| **CAND\_ZIP** | **CAND\_CITY** | **CAND\_STATE** |
| 02228 | Noida | UP |
| 201010 | Boston | US |
| 60007 | Chicago | US |
| 06389 | Norwich | UK |
| 462007 | Bhopal | MP |

**Transitive Dependency in DBMS**

A transitive dependency refers to some non-prime attribute other than the candidate key that depends on another non-prime attribute that is dependent entirely on the candidate key.

Whenever some indirect relationship happens to cause functional dependency (FC), it is known as Transitive Dependency. Thus, if A -> B and B -> C are true, then A -> C happens to be a transitive dependency.

Thus, to achieve 3NF, one must eliminate the Transitive Dependency.

Note:

The given functional dependency can only be transitive when it is formed indirectly by two FDs. For example,

P -> R happens to be a transitive dependency when the following functional dependencies hold true:

P -> Q

Q does not -> P

Q -> R

The transitive dependency can occur easily only in the case of some given relation of three or more attributes. Such a type of dependency helps us in normalizing the database in their 3rd Normal Form (3NF).

**Prime and Non-Prime Attribute**

A prime attribute is an attribute that is part of any candidate key. It can also be used to uniquely identify a tuple in the schema. A prime attribute in DBMS is also known as a key attribute. A non-prime attribute is one that is not part of one of the candidate keys.

**Candidate Key**

A candidate key, or simply a key, of a relational database is a minimal super key. In other words, it is any set of columns that have a unique combination of values in each row, with the additional constraint that removing any column could produce duplicate combinations of values.