Normal forms in DBMS

Abstract : Normalization is process of reducing data redundancy from the database table.

* It eliminates insertion ,deletion and updation anomalies.
* First Normal Form
* Second Normal Form
* Third Normal Form
* Boyce -Codd Normal Form

Problem without Normalization of tables :

1. Redundant Data : Unnecessary space
2. Insertion deletion and updation anomalies

Insertion anomalies : Where patient issue is null for 50 patients

Update anomalies : Missed to update all the records causes data inconsistency.

Deletion anomalies – delete the doctor record in case the patient gets discharges from hospital.

List of Normal Forms in Database :

1NF

2NF

3NF

BCNF

Prime attributes :

Attributes that are part of candidate keys are called prime attributes.

Non -prime attributes :

Attributes that are not part of any candidate key are called non -prime attributes

1NF:

* Tables are in 1NF if they do not contain composite attributes , **mutivalued attributes** or combination.

Table

Description automatically generated

Table

Description automatically generated

2NF :

* Should not contain partial dependencies

When a non -prime attribute depends on proper subset of candidate key then is called partial dependency.

Table

Description automatically generated

Student\_Roll\_No and Branch\_Nanme is candidate key.

Head of department is dependent .

When a non-prime attribute depends on propert subset of candidate key then it is called partial dependency.

We need to remove it to make the table in 2NF.

Solution is to split the table into 2.

Table

Description automatically generated

Third Normal Form Rule :

Tables are in 3NF if they are in 2NF and do not contain transitive dependencies.

Transitive dependency : Transitive dependency happens when one non-prime attribute depends on another non-prime attribute.

Three Attributes A, B and C

A is candidate key, B and C are part of candidate key so non-prime attributes.

C is dependent on B . B is dependent on A because A is candidate key. Implies C is dependent on A.

This is called transitive dependency.

Solution is to split the table

Table

Description automatically generated

Table

Description automatically generated

BCNF:

Table

Description automatically generated

Consider list of students ,each student is assigned more than one subject .Each subject can have more than one faculty. Each faculty can teach one subject only.

Candidate key is student roll and subject

1. {Student\_Roll\_No,Subject} -> Faculty
2. Faculty -> Subject — Subject is dependent on Faculty because each faculty can teach one subject i.e for every same faculty we will have the same Subject.

Because in dependency 2, the Faculty is not the super key so it is not in BCNF.

Solution for BCNF :

Table

Description automatically generated

**Summary:**

* Normalization is the process of reducing data redundancy from the database table.
* Tables are in 1NF if they should not contain composite attributes, multivalued attributes, or their combination.
* Tables are in 2NF if they are in 1NF and should not contain partial dependencies.
* Tables are said to be in 3NF if they are in 2NF and should not contain transitive dependencies.
* Tables are said to be in BCNF if they are in 3NF, and for any dependency A -> B, A should be a super key.

**Problem Solving Tip:** First find the candidate key and the functional dependencies in a table to achieve the normalization of the table.