

Database CS 33 Unit - IV Topic - 5th Normalization

Topic - Fifth normal form (5NF)

The 5NF (Fifth Normal Form) is also known as project-join normal form. A relation is in Fifth Normal Form (5NF), if it is in 4NF, and won't have lossless decomposition into smaller tables.

You can also consider that a relation is in 5NF, if the candidate key implies every join dependency in it.

A relation is in 5NF if it is in 4NF and not contains any join dependency and joining should be lossless.

5NF is satisfied when all the tables are broken into as many tables as possible in order to avoid redundancy.

5NF is also known as Project-join normal form (PJ/NF).

Example

SUBJECT	LECTURER	SEMESTER
Computer	Anshika	Semester 1
Computer	John	Semester 1
Math	John	Semester 1
Math	Akas	Semester 2
Chemistry	Praveen	Semester 1

In the above table, John takes both Computer and Math class for Semester 1 but he doesn't take Math class for Semester 2. In this case, combination of all these fields required to identify a valid data.

Suppose we add a new Semester as Semester 3 but do not know about the subject and who will be taking that subject so we leave Lecturer and Subject as NULL. But all three columns together acts as a primary key, so we can't leave other two columns blank.

So to make the above table into 5NF, we can decompose it into three relations P1, P2 & P3:

P1

SEMESTER	SUBJECT
Semester 1	Computer
Semester 1	Math
Semester 1	Chemistry

Database CS 33 Unit - IV Topic - 5th Normalization

Semester 2 Math

P2

SUBJECT LECTURER

Computer Anshika

Computer John

Math John

Math Akash

Chemistry Praveen

P3

SEMSTER LECTURER

Semester 1 Anshika

Semester 1 John

Semester 1 John

Semester 2 Akash

Semester 1 Praveen

Example 2

The below relation violates the Fifth Normal Form (5NF) of Normalization -

<Employee>

EmpName	EmpSkills	EmpJob (Assigned Work)
David	Java	E145
John	JavaScript	E146
Jamie	jQuery	E146
Emma	Java	E147

The above relation can be decomposed into the following three tables; therefore, it is not in 5NF

-

Database CS 33 Unit - IV Topic - 5th Normalization

<EmployeeSkills>

EmpName	EmpSkills
David	Java
John	JavaScript
Jamie	jQuery
Emma	Java

The following is the <EmployeeJob> relation that displays the jobs assigned to each employee -

<EmployeeJob>

EmpName	EmpJob
David	E145
John	E146
Jamie	E146
Emma	E147

Here is the skills that are related to the assigned jobs -

<JobSkills>

EmpSkills	EmpJob
Java	E145
JavaScript	E146
jQuery	E146
Java	E147

Our Join Dependency -

{(EmpName, EmpSkills), (EmpName, EmpJob), (EmpSkills, EmpJob)}

The above relations have join dependency, so they are not in 5NF. That would mean that a join relation of the above three relations is equal to our original relation <Employee>.