Third Normal Form

In this lesson, we will discuss the concept behind 3NF using an example.

WE'LL COVER THE FOLLOWING

Third normal form (3NF)

For a table to be in the third normal form:

1. It should be in the second normal form.
2. It should not have transitive dependency.

Example

SCORE Table

Std_Id	Subject_Id	Marks_obtained	Exam_Type	Total_Marks
1	CS-100	50	Final	100
2	CS-100	70	Final	100
3	CS-100	85	Final	100
1	Math-101	30	Mid-term	50
1	PHY-100	10	Practical	30

2	CHEM-100	20	Practical	30
3	PHY-120	40	Mid-term	50

From the table, we can see that the primary key for our SCORE table is a composite key, which means it's made up of two attributes (columns): {`Std_Id`, `subject_Id`}.

The column `Exam_Type` depends on both `Std_Id` and `Subject-Id`. For example, a student taking a chemistry course will have a practical lab exam but a student in a mathematics course will not. So we can say that `Exam_Type` is dependent on the whole composite key, thus there is no partial dependency, so the table is in 2NF.

But what about the column `Total_Marks`? Does it depend on our SCORE table's primary key?

Well, the column `Total_Marks` depends on `Exam_Type` since the type of exam the total score changes. For example, practicals are worth fewer marks while theory exams are worth more marks.

This results in a transitive dependency because a non-prime attribute depends on other non-prime attributes rather than depending upon the prime attributes or primary key.

So, in order to convert this table into 3NF, we take out the attributes `Exam_Type` and `Total_Marks` from the SCORE table and put them in their own table called the EXAM table. We will also add another column called `Exam_Id` in the EXAM table to act as the primary key. This column will also be added to the SCORE as a foreign key, so now we have a link between the two tables.

This is illustrated below:

SCORE table

Std_Id	Subject_Id	Marks_obtained	Exam_Id

EXAM table

Exam_Id	Exam_Type	Total_Marks

		allied	
1	CS-100	50	1
2	CS-100	70	1
3	CS-100	85	1
1	Math-101	30	2
1	PHY-100	10	3
2	CHEM-100	20	3
3	PHY-120	40	2

1	Final	100
2	Mid-term	50
3	Practical	30

In the next lesson, we will learn about our final normal form which is the Boyce-Codd normal form.