

# Normalization

# 1) DEFINE NORMALIZATION

**Normalization can be defined as :-**

- A process of organizing the data in database to avoid data redundancy, insertion anomaly, update anomaly & deletion anomaly.
- A process of organizing data into tables in such a way that the results of using the database are always unambiguous and as intended. Such normalization is intrinsic to relational database theory. It may have the effect of duplicating data within the database and often results in the creation of additional tables.

# Types of normalization

- First Normal Form (1NF)
- Second Normal Form (2NF)
- Third Normal Form (3NF)

And,  
Higher Normal Forms

## First Normal Form:

- ✓ Remove Repeating Groups

(Each cell in a relation should have only one value (Atomic value))

## Second Normal Form:

- ✓ Remove Partial Dependency

(All non-key attributes functionally dependent on the whole primary key)

## Third Normal Form:

- ✓ Remove Transitive Dependency

(No non-key attributes is functionally dependent on another non-key attribute.)

# First Normal Form (1NF)

First normal form enforces these criteria:

- ▶ Eliminate repeating groups in individual tables.
- ▶ Create a separate table for each set of related data.
- ▶ Identify each set of related data with a primary key

# First Normal Form

Table_Product		
<u>Product Id</u>	Colour	Price
1	Black, red	Rs.210
2	Green	Rs.150
3	Red	Rs. 110
4	Green, blue	Rs.260
5	Black	Rs.100

This table is not in first normal form because the “Colour” column contains multiple Values.

Solution:

After decomposing it into first normal form it looks like:

**Product Table:**

<u>Product_id</u>	Price
1	Rs.210
2	Rs.150
3	Rs. 110
4	Rs.260
5	Rs.100

**Color Table:**

<u>Product_id</u>	Colour
1	Black
1	Red
2	Green
3	Red
4	Green
4	Blue
5	Black

## Second Normal Form (2NF)

A table is said to be in 2NF if both the following conditions hold:

- ▶ Table is in 1NF (First normal form)
- ▶ No non-prime attribute is dependent on the proper subset of any candidate key of table.

An attribute that is not part of any candidate key is known as non-prime attribute.



## Functional Dependencies:

If one set of attributes in a table determines another set of attributes in the table, then the second set of attributes is said to be functionally dependent on the first set of attributes.

**Price X Quantity = Total**

**Table Schema:** **Book**(ISBN, Title, Price)


**Functional dependencies:** (ISBN)  $\twoheadrightarrow$  Title

(ISBN)  $\twoheadrightarrow$  Price

BOOK Table:

ISBN	Title	Price

# SECOND NORMAL FORM



Non-Key attribute

<u>Custome_id</u>	<u>Store_id</u>	Location
1	1	USA
1	3	Japan
2	1	USA
3	2	Korea
4	3	Japan

- This table has a composite primary key i.e. customer id, store id. The non key attribute is location. In this case location depends on store id, which is part of the primary key.

Solution:

After decomposing it into second normal form it looks like:

Composite P.K

Table Purchase	
<u>Customer_id</u>	<u>Store_id</u>
1	1
1	3
2	1
3	2
4	3

P.K

Table Store	
<u>Store_id</u>	Location
1	USA
3	Japan
1	USA

## Third Normal Form (3NF)

A table design is said to be in 3NF if both the following conditions hold:

- ▶ Table must be in 2NF
- ▶ Transitive functional dependency of non-prime attribute on any super key should be removed.

An attribute that is not part of any candidate key is known as non-prime attribute.

In other words 3NF can be explained like this: A table is in 3NF if it is in 2NF and for each functional dependency  $X \rightarrow Y$  at least one of the following conditions hold:

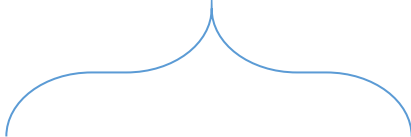
- ▶ X is a super key of table
- ▶ Y is a prime attribute of table

An attribute that is a part of one of the candidate keys is known as prime attribute.

## Third Normal Form (3NF)

Student Table:

Should be No interdependencies  
between/among non-key attributes.



<u>Roll_No</u>	S_Name	Class	Teacher_ID	Teacher_Name
101	Stella	BBA	301	Dr. John
103	Tracey	MBA	305	Dr. Ellis

Solution:

# After decomposing it into Third Normal Form:

Student Table:

<u>Roll_No</u>	S_Name	Class	F.K Teacher_ID
101	Stella	BBIT	301
103	Tracey	MBA	305

Teacher Table:

P.K <u>Teacher_ID</u>	Teacher_Name
301	Dr. John
305	Dr. Ellis