



# RELATIONAL DATABASE MANAGEMENT SYSTEM (NORMALIZATION)

# RELATIONAL DATA MODEL

- Relational model consists, collection of tables. Table has number of rows & columns.
- The row of table is known as record or **Tuple**.
- The column of table is known as **attribute**.
- For every attribute, there is a set of permitted values, it is called as **domain** of that attribute.

EMPID	EMPNAME	SALARY
E101	Rupali	15,000
E102	Rahul	20,000
E103	Aniruddha	25,000
E104	Poonam	18,000
E105	Prashant	19,000
E106	Shrikant	13,000

Attribute

Tuple



# WHAT DO YOU MEAN BY RELATIONAL DATABASE DESIGN ???

- A relational database is made up of a number of relations and corresponding relational database schema.
- A relation in a relational database is based on a relation schema, which consists of a number of attributes.
- The goal of a relational database design is to generate a set of relation schema that allows us to store information without unnecessary repetition of information and also to retrieve information easily.



# WHEN THE DATABASE DESIGN SAID TO GOOD DATABASE DESIGN ???....

- ❑ No repetition of information.
- ❑ No anomalies.
- ❑ No inability to represent information.
- ❑ No loss of information.



# INTRODUCTION TO NORMALIZATION.

- ❑ Normalization is a set of rules that have been established to aid the design of tables that are meant to be connected through relation ships.
- ❑ The main objective of normalization is to eliminate redundancy, insertion deletion updation anomalies.
- ❑ In normalization, database is divided into two or more tables and relationships are defined between the tables.



## BENEFITS OF NORMALIZING DATABASE

- 1) Avoiding repetitive entries.
- 2) Reducing required storage space.
- 3) Preventing the need to restructure existing, tables to accommodate new data.
- 4) Increased Speed and flexibility of queries sorts and summaries.



# PURPOSE OF NORMALIZATION

Consider the following example of bad database design.

Name	Subject	Ph. No.	Branch	Prof.	Grade
Rupali	OOP	0253-2316715	Computer	Joshi	A
Riya	Java	020-2424469	IT	Sane	B
Rupali	VB	0253-2316715	Computer	Kulkarni	A
Nidhi	Physics	020-4422009	Comp-Sci	Raje	B
Priti	Chemistry	0253-2501548	Comp-Sci	Sinha	A
Nidhi	CMF	020-4422009	Comp-Sci	Kale	C
Soham	Multimedia	020-2314151	IT	Rane	B



- The above database design is not good database design. The relation Student data can lead to several undesirable problems.
  - Redundancy
  - Update anomalies
  - Insertion anomalies
  - Deletion anomalies
- Because of these reasons normalization is needed for database design. The Normalization divides this table into
  - Student\_Info (Name, Ph.No, Branch)
  - Result (Name, Subject, Grade)
  - Teacher(Subject, Prof.)





Name	Subject	Grade
Rupali	OOP	A
Riya	Java	B
Nidhi	Physics	B
Priti	Chemistry	A
Soham	Multimedia	B

Result

Teacher

Name	Ph. No	Branch
Rupali	0253-2316715	Computer
Riya	020-2424469	IT
Nidhi	020-4422009	Comp-Sci
Priti	0253-2501548	Comp-Sci
Soham	020-2314151	IT

Student\_info

Subject	Prof
OOp	Joshi
Java	Sane
Physics	Raje
Chemistry	Sinha
CmF	Kale
Multimedia	Rane
VB	Kulkarni



# FUNCTIONAL DEPENDENCY.

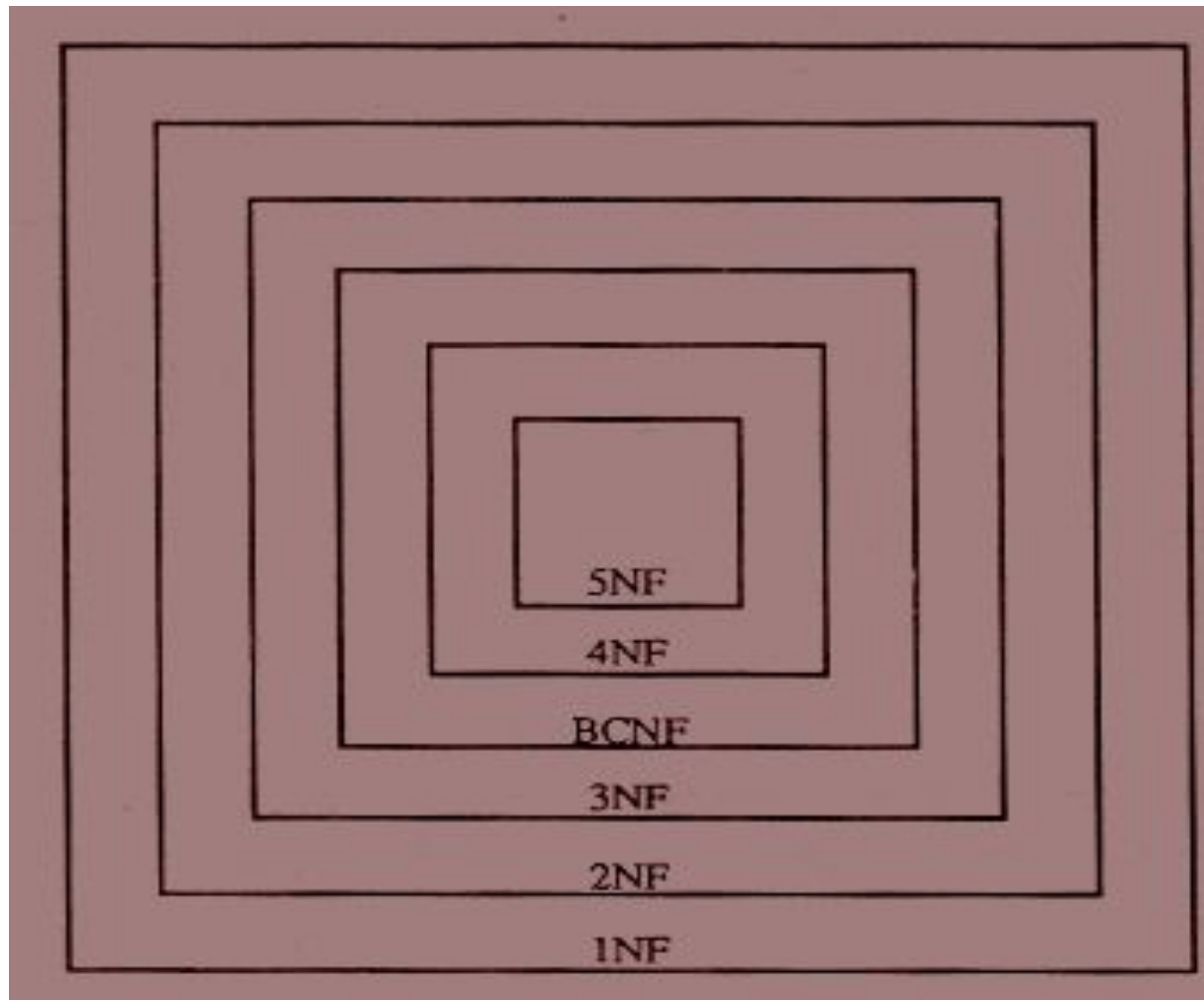
- If there is relation R with attribute x and attribute y. We can say that there is a dependency between x & y. (x is key of relation R) if x identifies a tuple & hence a particular instance of entity.
- In other words, if x uniquely identify the attribute set y.
- Functional dependency is denoted by  $x \rightarrow y$   
i.e. y is functionally dependent on x.

ID	Name	Address
1	Rohan	Pune
2	Ashish	Nashik
3	Kriti	Mumbai
4	Rohan	Nagpur

$ID \rightarrow Name$   
 $ID \rightarrow Address$



# NORMAL FORMS



## FIRST NORMAL FORM :- [1NF]

- ❑ A relation is said to be in first normal form, if the values in the domain of each attribute of relation are atomic.
- ❑ In other words, only one value is associated with each attribute & value is not a set of values or list of values.

NAME	PHNO	
YOGITA	8975679176 9270472256	



## CONSIDER THE FOLLOWING EXAMPLE

Faculty Dept	Prof	Course	Course Dept.
Computer	Prof. Kulkarni	353	Computer
		379	Computer
		222	IT
Chemistry	Prof. Sathe	353	Computer
		455	E & TC
		244	Chemistry

The above relation can be converted into 1NF as -

Prof	Course	Faculty Dept	CourseDept
Prof. Kulkarni	353	Computer	Computer
Prof. Kulkarni	379	Computer	Computer
Prof. Kulkarni	222	Computer	IT
Prof. Sathe	353	Chemistry	Computer
Prof. Sathe	455	Chemistry	E & TC
Prof. Sathe	244	Chemistry	Chemistry



# SECOND NORMAL FORM (2 NF)

- A Table in the 2nd normal form if :
  - i) It is in 1NF.
  - ii) It includes no partial dependencies.



The following example shows the partial dependencies.  
Partial Dependency

**Profile**

Name	Course	Phone-no	Dept	Subject
Rahul	353	020-2317151	Computer	oop
Nidhi	352	020-454671	Mechanical	Eng. Drawing
Priya	452	022-2405061	Computer	VB
Rahul	431	022-2516171	IT	DCN

- The given relation has various functional dependencies.

Name, Course  $\rightarrow$  Dept

Name, Course  $\rightarrow$  Subject

Name  $\rightarrow$  Phone - No.



- The steps to convert table into 2nd Normal form.
  - 1) Find and remove field that are related to the only part of the key.
  - 2) Group the removed items in the another table.
  - 3) Assign the new table with the key i.e. part of a whole key.
- The above relation is converted 2NF as.

**Profile**

ID	Name	Course	Phone No.	Oept	Subject
1	Rahul	353	020-2317151	Computer	oop
2	Nidhi	352	020-454671	Mechanical	Eng.Drawing
3	Priya	452	022-2405061	Computer	VB
4	Rahul	431	022-2516171	IT	DCN

This relation containing following functional dependency.

id  $\rightarrow$  Name, Course, Phone No, Dept, Subject





## THIRD NORMAL FORM (3 NF)

- The relation or table is said to be in third normal form if-
  - i) It is in 2nd Normal form.
  - ii) It contains no transitive dependencies.

Transitive dependency:

It just same as in mathematical form,

e.g. :  $A = B$  &  $B = C$

Hence  $A = C$ .

It is known as transitive dependency.



- The following example shows the transitive dependencies.

**Profile**

Course	Prof	Room No.	Room-Cap	Enroll-limit
Comp	Prof. Shukla	A1	40	60
IT	Prof. Sahani	A2	40	60
E & TC	Prof. Gupta	A3	40	60
Mech	Prof. Shah	A4	40	60

Here In this relation there are following functional dependencies.

$\text{Course} \rightarrow \{ \text{Prof, room, Enroll-limit} \}$

$\text{room} \rightarrow \text{room-cap} \rightarrow \text{Enroll-limit}$

OR

$\text{room} \rightarrow \text{room-cap}$

$\text{room cap} \rightarrow \text{Enroll-limit}$

$\text{room} \rightarrow \text{Enroll-limit}$



- ❑ In order to have the relation in 3rd normal form we can decompose a single relation or table into more than 1 relation or table.
- ❑ The above table is decomposed in the following tables.

**Course**

Course	Prof	Enroll-limit
Comp	Prof. Shukla	60
IT	Prof. Sahani	60
E & TC	Prof. Gupta	40
Mech	Prof. Shah	60

**Room**

room	room-cap
A1	40
A2	40
A3	40
A4	40

**Schedule**

Course	room
Comp	A1
IT	A2
E & TC	A3
Mech	A4

Thank You !!!

