Normalization

Normalization is the process of organizing the data in the database.

Normalization is used to minimize the redundancy of data.

Normalization divides the larger table into the smaller table.

1NF

A relation will be in 1NF if it contains an atomic value in a cell of the table.

id	name	Dept.
1	Gautam	Developer, Business
2	Ravi	Testing

id	name	Dept.
1	Gautam	Developer
2	Gautam	Business
2	Ravi	Testing

2NF

In the 2NF, relational must be in 1NF. There must be a primary key in the table.

id	name	Dept.
1	Gautam	Developer
2	Gautam	Business
2	Ravi	Testing

id	name
1	Gautam
2	Ravi

Dept_id	Dept_name
1	Developer
2	Business
3	Testing

3NF

A relation will be in 3NF if it is in 2NF and not contain any transitive partial dependency.

For each functional dependency X ⟶ A in R,

at least one of the following conditions are met:

X is superkey in R

A is a prime attribute in R

emp_id	emp_name	emp_zip	emp_state	emp_city
1001	John	282005	UP	Agra
1002	Ajeet	222008	TN	Chennai
1006	Lora	282007	TN	Chennai
1101	Lilly	292008	UK	Pauri

Here, emp_state, emp_city dependent on emp_zip. And, emp_zip is dependent on emp_id that makes non-prime attributes (emp_state, emp_city) transitively dependent on super key (emp_id). This violates the rule of 3NF.

emp_id	emp_name	emp_zip
1001	John	282005
1002	Ajeet	222008
1006	Lora	282007
1101	Lilly	292008

emp_zip	emp_state	emp_city
282005	UP	Agra
222008	TN	Chennai
282007	TN	Chennai
292008	UK	Pauri

BCNF

A relation R is in BCNF if it is in 3NF and for each functional dependency X ⟶ A in R, X is a key or superkey in R. In other words, the only difference between 3NF and BCNF is that in BCNF it is not present the second condition of the 3NF. This makes BCNF stricter than 3NF as any relation that is in BCNF will be in 3NF but not necessarily every relation that is in 3NF will be in BCNF

emp_id	emp_nationality	emp_nationality	emp_dept	dept_type	dept_no_of_emp
1001	Austrian	Austrian	Production	D001	200
1001	Austrian	Austrian	stores	D001	250
1002	American	American	design	D134	100
1002	American	American	Purchasing	D134	600

emp_id	emp_nationality
1001	Austrian
1002	American

emp_dept	dept_type	dept_no_of_emp
Production	D001	200
stores	D001	250
design	D134	100
Purchasing	D134	600

emp_id	emp_dept
1001	Production
1001	stores
1002	design
1002	Purchasing

4NF

Tables cannot have multi-valued dependencies on a Primary Key.