TOPIC- Multivalued dependency

When existence of one or more rows in a table implies one or more other rows in the same table, then the Multi-valued dependencies occur.

Multivalued dependency occurs when two attributes in a table are independent of each other but, both depend on a third attribute.

A multivalued dependency consists of at least two attributes that are dependent on a third attribute that's why it always requires at least three attributes.

Example: Suppose there is a bike manufacturer company which produces two colors(white and black) of each model every year.

BIKE_MODEL	MANUF_YEAR	COLOR
M2011	2008	White
M2001	2008	Black
M3001	2013	White
M3001	2013	Black
M4006	2017	White
M4006	2017	Black

Here columns COLOR and MANUF_YEAR are dependent on BIKE_MODEL and independent of each other.

In this case, these two columns can be called as multivalued dependent on BIKE_MODEL. The representation of these dependencies is shown below:

BIKE_MODEL → → MANUF_YEAR

BIKE_MODEL → → COLOR

This can be read as "BIKE_MODEL multidetermined MANUF_YEAR" and "BIKE_MODEL multidetermined COLOR".

If a table has attributes P, Q and R, then Q and R are multi-valued facts of P.

It is represented by double arrow – ->->

For example:

P->->Q

P->->R

In the above case, Multivalued Dependency exists only if Q and R are independent attributes.

A table with multivalued dependency violates the 4NF.

Example

Let us see an example & mins;

Table - Student

StudentName	CourseDisciplin	Activities
Amit	Mathematics	Singing
Amit	Mathematics	Dancing
Yuvraj	Computers	Cricket
Akash	Literature	Dancing
Akash	Literature	Cricket
Akash	Literature	Singing

In the above table, we can see Students Amit and Akash have interest in more than one activity.

This is multivalued dependency because CourseDiscipline of a student are independent of Activities, but are dependent on the student.

Therefore, multivalued dependency –

StudentName ->-> CourseDiscipline

StudentName ->-> Activities

The above relation violates Fourth Normal Form in Normalization.

To correct it, divide the table into two separate tables and break Multivalued Dependency –

<StudentCourse>

StudentName	CourseDiscipline
Amit	Mathematics

Amit	Mathematics
Yuvraj	Computers
Akash	Literature
Akash	Literature
Akash	Literature

<StudentActivities>

StudentName	Activities
Amit	Singing
Amit	Dancing
Yuvraj	Cricket
Akash	Dancing
Akash	Cricket
Akash	Singing

This breaks the multivalued dependency and now we have two functional dependencies –

StudentName -> CourseDiscipline

StudentName - > Activities