

BRM\_LAB



INTRODUCTION

NAME: AMAN PANT

BRANCH: DevOps

ROLL NUMBER: R171219042

SAP Id: 500077611

SEMESTER: IV

SUBJECT: BRM LAB

SUBMITTED TO:

HITESH KUMAR

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## MULTIVALUED DEPENDENCY-

## DEFINITIONS-

## Multivalued dependency represents a dependency between attributes (let A, B, C) in a relation R such that for each value of A there is a set of values of B and a set of values for C. However the set of values of B and C are independent of each other (because of this independency there is a lot of redundancy in relation R).

## 

## OR

## In a relation schema R, an attribute is said to be multi dependent on attribute A if and only if for a particular value of A the set of values of B is completely determined by the value of A alone and is independent of the values of C where A,B and C are subsets of the attributes of R.

## SOME IMPORTANT POINTS ABOUT MULTIVALUED DEPENDENCY-

## A dependency A->B is said to be multivalued if for a single value A more than one value occurs

## When one or more attribute in a table do not depend on each other but both depend on some other attribute in the same table, then the Multi-valued dependencies occur.

In a table multivalued dependency can exist for more than one column too.

A table with multivalued dependency violates the 4NF.

It is a special case of join dependency.

A table can have both functional dependency and multivalued dependency.

If a table has attributes A, B and C, then B and C are multi-valued facts of A and should be independent.

For a table to have multivalued dependency it should have at least three columns.

**BUT WHY :-**

Because if we have only two columns in a table we can simply distribute the multivalued data into multiple rows and there is no need for decomposing the table and the two other columns must not depend on each other

**REPRESENTATION-**

|  |
| --- |
| **->->**  **CONDITIONS FOR MULTIVALUED DEPENDENCY-**  If all the given points are true then we can say that it will be having multivalued dependency   1. FOR A->B, for a single value of A more than one value of B exists. 2. Table should have at least three columns. 3. For this table with A, B, C columns, B and C should be independent. |

**SOME EXAMPLES OF MULTIVALUED DEPENDENCY-**

**EXAMPLE 1-**

|  |  |  |
| --- | --- | --- |
| **Student Name** | **Subject** | **Activities** |
| Aman | Maths | Swimming |
| Aman | Maths | Singing |
| Yash | Hindi | Cricket |
| Vijay | Biology | Singing |
| Vijay | Biology | Swimming |
| Vijay | Biology | Cricket |

In the above table, we can see Students **Aman** and **Vijay** have interest in more than one activity.

**This is multivalued dependency because**

1. for Student more than one values are dependent on it.
2. Table have three columns
3. Subject of a student are independent of Activities

The representations of these dependencies is shown below:-

|  |
| --- |
| **Student Name ->-> Subject Student Name ->-> Activities** |

The above relation violates Fourth Normal Form in Normalization.

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

**<Student Course>**

|  |  |
| --- | --- |
| **Student Name** | **Subject** |
| Aman | Maths |
| Aman | Maths |
| Yash | Hindi |
| Vijay | Biology |
| Vijay | Biology |
| Vijay | Biology |

**<Student Activities>**

|  |  |
| --- | --- |
| **Student Name** | **Activities** |
| Aman | Swimming |
| Aman | Singing |
| Yash | Cricket |
| Vijay | Singing |
| Vijay | Swimming |
| Vijay | Cricket |

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

**Student Name->Subject**

**Student Name->Activities**

|  |  |  |
| --- | --- | --- |
| **MODEL** | **MAN-YEAR** | **DESIGN** |
| R1002 | 2002 | OMEGA |
| R1002 | 2002 | R3 |
| Q1200 | 2012 | OMEGA |
| Q1200 | 2012 | R3 |
| S5410 | 2020 | OMEGA |
| S5410 | 2020 | R3 |

**EXAMPLE 2-**

Suppose there is a CAR manufacturer company which produces two DESIGN (OMEGA and R3) of each model every year

Here columns DESIGN and MAN-YEAR are independent of each other but are dependent on MODEL i.e. models are having more than one design in the same year

In this case, MAN-YEAR and DESIGN can be called as multivalued dependent on MODEL.

**This is multivalued dependency because**

1. for MODEL more than one values are dependent on it.
2. Table have three columns
3. MAN-YEAR of a MODEL are independent of DESIGN.

The representation of these dependencies is shown below:

**MODEL->->MAN-YEAR**

**MODEL->->DESIGN**

The above relation violates Fourth Normal Form in Normalization.

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

**<Model Year>**

|  |  |
| --- | --- |
| **MODEL** | **MAN-YEAR** |
| R1002 | 2002 |
| R1002 | 2002 |
| Q1200 | 2012 |
| Q1200 | 2012 |
| S5410 | 2020 |
| S5410 | 2020 |

**<Model Design>**

|  |  |
| --- | --- |
| **MODEL** | **DESIGN** |
| R1002 | OMEGA |
| R1002 | R3 |
| Q1200 | OMEGA |
| Q1200 | R3 |
| S5410 | OMEGA |
| S5410 | R3 |

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

**MODEL->YEAR**

**MODEL->DESIGN**

**EXAMPLE 3-**

|  |  |  |
| --- | --- | --- |
| **STUDENT\_ID** | **DEPT\_NO** | **COURSE** |
| 500077611 | D1 | C1 |
| 500077611 | D1 | C2 |
| 500077690 | D2 | C3 |
| 500077601 | D3 | C1 |
| 500077601 | D3 | C2 |
| 500077601 | D3 | C3 |

In the above table, we can see STUDENT\_ID **500077611** and **500077601** have more than one courses enrolled.

**This is multivalued dependency because**

1. for STUDENT\_ID more than one values are dependent on it.
2. Table have three columns
3. DEPARTMENT NUMBER of a student are independent of COURSE.

The representation of these dependencies is shown below:

**STUDENT\_ID->->DEPT\_NO**

**STUDENT\_ID->->COURSE**

The above relation violates Fourth Normal Form in Normalization.

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

**<STUDENT DEPARTMENT>**

|  |  |
| --- | --- |
| **STUDENT\_ID** | **DEPT\_NO** |
| 500077611 | D1 |
| 500077611 | D1 |
| 500077690 | D2 |
| 500077601 | D3 |
| 500077601 | D3 |
| 500077601 | D3 |

**<STUDENT COURSE>**

|  |  |
| --- | --- |
| **STUDENT\_ID** | **COURSE** |
| 500077611 | C1 |
| 500077611 | C2 |
| 500077690 | C3 |
| 500077601 | C1 |
| 500077601 | C2 |
| 500077601 | C3 |

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

**STUDENT\_ID->DEPT\_NO**

**STUDENT\_ID->COURSE**