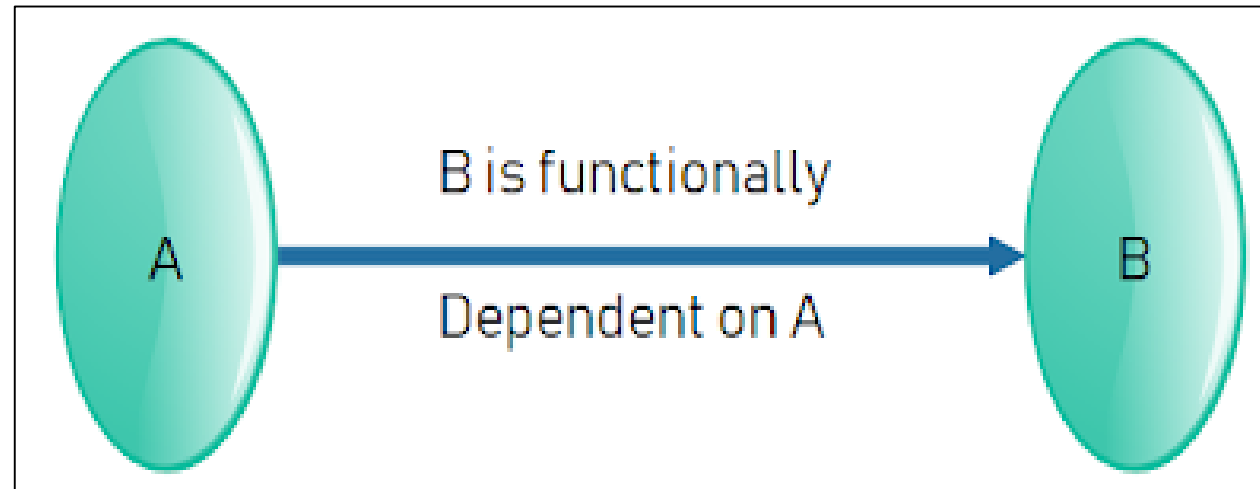


# Database Management Systems (BCSC – 1003)

## Topic: **Functional Dependency**



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# Functional Dependency

- The functional dependency is a relationship that exists between two attributes.
- It typically exists between the primary key and non-key attribute within a table.
- It is usually denoted as:  $X \rightarrow Y$
- The left side of arrow is known as a determinant, the right side of the arrow is known as a dependent.

# Functional Dependency

Example:

Assume, we have an EMPLOYEE table with attributes: Emp\_Id, Emp\_Name, Emp\_Address.

Here Emp\_Id attribute can uniquely identify the Emp\_Name attribute of employee table because if we know the Emp\_Id, we can tell that employee name associated with it. Functional dependency can be written as:

$\text{Emp\_Id} \rightarrow \text{Emp\_Name}$

We can say that Emp\_Name is functionally dependent on Emp\_Id.

# Functional Dependency

## Types of Functional Dependencies:

1. Trivial functional dependency
2. Non-trivial functional dependency
3. Multivalued dependency
4. Transitive dependency

# Functional Dependency

## 1. Trivial functional dependency

$A \rightarrow B$  has trivial functional dependency if  $B$  is a subset of  $A$ . The following dependencies are also trivial like:  $A \rightarrow A$ ,  $B \rightarrow B$

Example:

Consider a table with two columns Employee\_Id and Employee\_Name.

$\{\text{Employee\_id}, \text{Employee\_Name}\} \rightarrow \text{Employee\_Id}$  is a trivial functional dependency as  $\text{Employee\_Id}$  is a subset of  $\{\text{Employee\_Id}, \text{Employee\_Name}\}$ .

Also,  $\text{Employee\_Id} \rightarrow \text{Employee\_Id}$  and

$\text{Employee\_Name} \rightarrow \text{Employee\_Name}$  are trivial dependencies too.

# Functional Dependency

## 2. Non-trivial functional dependency

$A \rightarrow B$  has a non-trivial functional dependency if  $B$  is not a subset of  $A$ .

When  $A$  intersection  $B$  is NULL, then  $A \rightarrow B$  is called as complete non-trivial.

Example:

$ID \rightarrow Name,$

$Name \rightarrow DOB$

# Functional Dependency

## 3. Multivalued functional 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.

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 as  $\rightarrow \rightarrow$

Example 1:

$$P \rightarrow \rightarrow Q$$
$$P \rightarrow \rightarrow R$$

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

# Functional Dependency

Example: Consider following table Prog\_Proj below showing Multivalued dependency.

PROG\_ PROJ

Programmer	Project	Modules
Vineet	P3	M61
Nikhil	P1	M31
Sanjay	P6	M99
Nikhil	P2	M61
Arvind	P1	M91
Nikhil	P1	M71
Sanjay	P7	M91
Nikhil	P2	M75
Vijay	P9	M61

Here columns PROJECT & MODULES are independent of each other and dependent on PROGRAMMER. In this case these two columns are said to be multivalued dependent on PROGRAMMER. These dependencies can be represented like this:

PROGRAMMER  $\twoheadrightarrow$  PROJECT and PROGRAMMER  $\twoheadrightarrow$  MODULES



# Functional Dependency

## 4. Transitive functional dependency

A functional dependency is said to be transitive if it is indirectly formed by two functional dependencies.

Example:

$X \rightarrow Z$  is a transitive dependency if the following functional dependencies hold true:

- $X \rightarrow Y$
- $Y \rightarrow Z$

A transitive dependency can only occur in a relation of three or more attributes. This dependency helps us normalizing the database in 3NF (3rd Normal Form).

# References



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*Thank  
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