

# LET'S START WITH DBMS :).

## Minimal cover of Functional Dependency

### Why Do We Need to Find Minimal Cover?

It is a simplified version of the original set of functional dependencies

1. It helps to remove redundant functional dependencies.
2. It reduces the complexity of the functional dependencies.
3. It ensures that there are no unnecessary dependencies, which can lead to anomalies in database operations (insertion, deletion, and update).

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## Minimal cover of Functional Dependency

### How to Find Minimal Cover?

Step 1: Decompose FDs (RHS) i.e  $X \rightarrow AB$  can be written as  $X \rightarrow A$ ,  $X \rightarrow B$

Step 2: Remove Redudant FD.

- a. Make a new FD set excluding the one you feel is redudant
- b. Now find the closure of LHS from the rest of the FD and see if it determines all the attributes of a table, if yes you can remove that, if no jump to the next one.

Step 3: Remove unnecessary attributes from LHS, if the determinant is a super key, it can be reduced to CK (minimal super key)

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## Find Minimal Cover FD: $A \rightarrow BC$ , $B \rightarrow C$ , $A \rightarrow B$ , $AB \rightarrow C$

**Step 1:**  $A \rightarrow B$ ,  $A \rightarrow C$ ,  $B \rightarrow C$ ,  $A \rightarrow B$ ,  $AB \rightarrow C$

FD:  $A \rightarrow B$ ,  $A \rightarrow C$ ,  $B \rightarrow C$ ,  $AB \rightarrow C$

### Step 2:

1. For  $A \rightarrow B$

FD:  $A \rightarrow C$ ,  $B \rightarrow C$ ,  $AB \rightarrow C$

$A^+ = \{A, C\}$  since  $A^+$  doesn't have all the attributes we shouldn't discard this

2. For  $A \rightarrow C$

FD:  $A \rightarrow B$ ,  $B \rightarrow C$ ,  $AB \rightarrow C$

$A^+ = \{A, B, C\}$ , since  $A^+$  have all the attributes we can discard this

Therefore, the minimal cover of the given functional dependencies is:

$\{A \rightarrow B, B \rightarrow C\}$

Step 1: Decompose FDs (RHS) i.e  $X \rightarrow AB$  can be written as  $X \rightarrow A$ ,  $X \rightarrow B$

Step 2: Remove Redudant FD.

a. Make a new FD set excluding the one you feel is redudant

b. Now find the closure of LHS from the rest of the FD and see if it determines all the attributes of a table, if yes you can remove that, if no jump to the next one.

Step 3: Remove unnecessary attributes from LHS, if the determinant is a super key, it can be reduced to CK (minimal super key)

3. For  $B \rightarrow C$

FD:  $A \rightarrow B$ ,  $AB \rightarrow C$

$B^+ = \{B\}$ , since  $B^+$  doesn't have all the attributes we shouldn't discard this

4. For  $AB \rightarrow C$

FD:  $A \rightarrow B$ ,  $B \rightarrow C$

$AB^+ = \{A, B, C\}$  since  $AB^+$  have all the attributes we can discard this