3 NF Example

- Let $R = \{A, B, C, D, E, F\}$
- Let the FD set be
 - $-ABF \rightarrow C$
 - $-CF \rightarrow B$
 - $-CD \rightarrow A$
 - $-BD \rightarrow AE$
 - $-C \rightarrow F$
 - $-B \rightarrow F$

Problem

• Create a set of 3NF tables from R and the FD set.

3NF Synthesis Algorithm

- Input: Set of attributes R and FDs F
- Step 1: Create a minimal cover for F called G
- Step 2. For each FD in G create a table. Call the tables T₁,T₂, ...
- Step 3: If none of the T_i contain a super key for the universal table create a new table containing the attributes of a key for the universal table

Minimal Cover Step 1 Decompose RHS

- $-ABF \rightarrow C$ $-CF \rightarrow B$ $-CD \rightarrow A$ $-BD \rightarrow AE$ $-C \rightarrow F$
- $\mathsf{B} \to \mathsf{F}$

- $-ABF \rightarrow C$ $-CF \rightarrow B$ $-CD \rightarrow A$ $-BD \rightarrow A$ $-BD \rightarrow E$
- $-C \rightarrow F$
- $B \rightarrow F$

Minimal Cover Step 2 Remove Redundant Attributes on LHS

- $-ABF \rightarrow C$ $-CF \rightarrow B$ $-CD \rightarrow A$ $-BD \rightarrow A$ $-BD \rightarrow E$ $-C \rightarrow F$
- $B \rightarrow F$

AB+ = ABFC A+ = A B+ = BF C+ = CFB F+ = FD+ = D $-AB \rightarrow C$ $-C \rightarrow B$ $-CD \rightarrow A$ $-BD \rightarrow A$ $-BD \rightarrow E$ $-C \rightarrow F$ $-B \rightarrow F$

Minimal Cover Step 3 Remove Redundant Dependencies

 $-AB \rightarrow C$ $-C \rightarrow B$ $-CD \rightarrow A$ $-BD \rightarrow A$ <u>– BD -> E</u> $-C \rightarrow F$ $-B \rightarrow F$

CD+=CDBA C + = CBF

 $-AB \rightarrow C$ $-C \rightarrow B$ $-BD \rightarrow A$ <u>– BD -> E</u> $-B \rightarrow F$

Minimal Cover Step 4 Combine Dependencies with common LHS

 $-AB \rightarrow C$ $-C \rightarrow B$ $-BD \rightarrow A$ $-BD \rightarrow E$ $-B \rightarrow F$

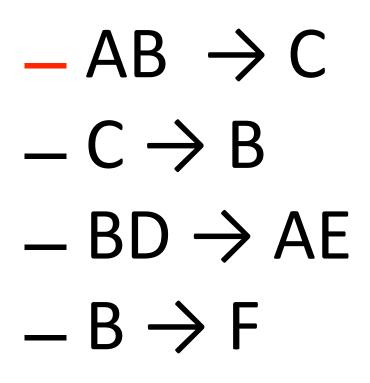
 $-AB \rightarrow C$ $-C \rightarrow B$ $-BD \rightarrow AE$ $-B \rightarrow F$

 $-AB \rightarrow C$ $-C \rightarrow B$ $-BD \rightarrow AE$ $-B \rightarrow F$

 $R1 = \{A, B, C\}$ $R2 = \{C, B\}$ $R3 = \{B, D, A, E\}$ $R4 = \{B, F\}$

3NF Synthesis Step 2 Make a table for each Dependency

3NF Synthesis Step 3 Does the attribute closure of the attributes of one of the tables include all attributes in the universal table? In this case yes.



R1 = {A, B, C} R2 = {C, B} R3 = {B, D, A, E} R4 = {B, F}

BDAE + = BDAECF

F