

8) IR8 (coalescence Rule for FDs and MVDs)

if  $X \twoheadrightarrow Y$  and  $\exists W$  with the properties that  
 a)  $W \cap Y$  is empty b)  $W \rightarrow Z$  and c)  $Y \supseteq Z$  then  
 $X \rightarrow Z$

IR1 through IR8 are used to infer the complete set of dependencies (FDs or MVDs), i.e.  $F^+$

Example

Let  $R(A, B, C, D)$  be the relation schema with  
 $F = \{A \twoheadrightarrow B, BC \rightarrow D\}$ . Test whether it is in  
 4NF or not. If not decompose  $R$  into 4NF.

$F^+ = \{A \twoheadrightarrow B, BC \rightarrow D, A \twoheadrightarrow CD\}$

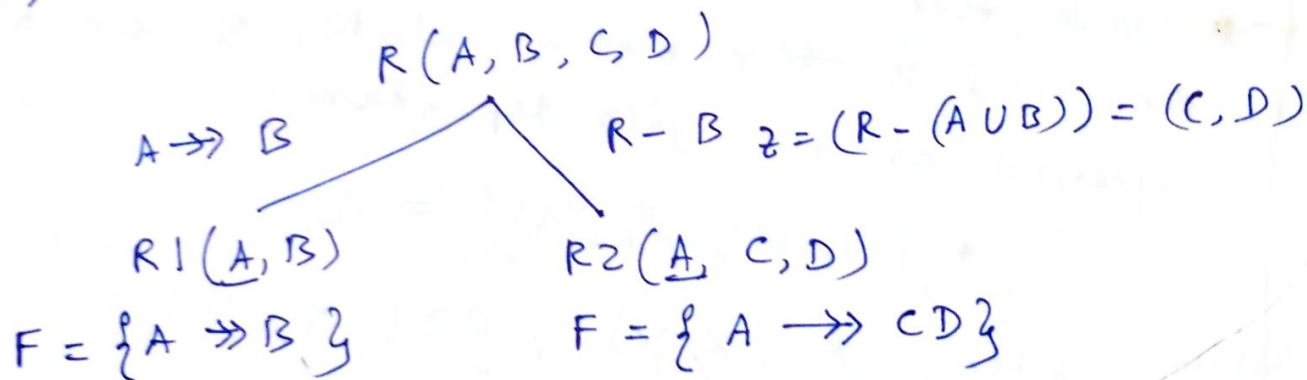
Sol<sup>n</sup>:

Primary key = ABC as  $(ABC)^+ = ABCD$

$A \twoheadrightarrow B$  is nontrivial as  $A \cup B \neq R$  and

$A$  is not a superkey. So,  $R$  is not in 4NF.

So, we decompose  $R$  into the following sub-schemes:



Rule IR4: If  $X \twoheadrightarrow Y$  holds in  $R$ , so does  $X \twoheadrightarrow Z$   
 where  $Z = (R - (X \cup Y))$

Now,  $R1$  and  $R2$  are 4NF normalized as  
 in each case  $A$  is the superkey. Both the MVDs  
 are trivial in  $R1$  and  $R2$ .