· 3NF vs BCNF

3NF	BCNF
· Definition	· Defn
· Lossless Decomposition is Possible.	· Not possible.
· Dependency preserving decomposition is Possible.	· Dependency preserving decomposition is not always possible.

Decomposition

Consider a rel^n $R(X, Y, Z, W, Q)$

$F = \{X \to Z, Y \to Z, Z \to W, WQ \to Z, ZQ \to X\}$ & the decomposition of R into rel^n $R_1(X, W)$, $R_2(X, Y)$, $R_3(Y, Q)$, $R_4(Z, W, Q)$ & $R_5(X, Q)$. Determine whether the decomposition is lossless or lossy.

· Catch all repeating in X & replace Z ($X \to Z$)

A:

	X(A_1)	Y(A_2)	Z(A_3)	W(A_4)	Q(A_5)
1 $R_1(X, W)$	a_1	b_{12}	b_{13}	a_4	b_{15}
2 $R_2(X, Y)$	a_1	a_2	b_{23}	b_{24}	b_{25}
3 $R_3(Y, Q)$	b_{31}	a_2	b_{33}	b_{34}	a_5
4 $R_4(Z, W, Q)$	b_{41}	b_{42}	a_3	a_4	a_5
5 $R_5(X, Q)$	a_1	b_{52}	b_{53}	b_{53}	a_5

· a_1 should have unique image. Now take smallest of Z and fill in 3rd col.

· If a_i is there then replace with a_i not b_{ij}

$X \to Z$

	$X(A_1)$	$Y(A_2)$	$Z(A_3)$	$W(A_4)$	$Q(A_5)$
$R_1(X,W)$	a_1	b_{12}	b_{13}	a_4	b_{15}
$R_2(X,Y)$	a_1	a_2	b_{13}	b_{24}	b_{25}
$R_3(Y,Q)$	b_{31}	a_2	b_{33}	b_{34}	a_5
$R_4(Z,W,Q)$	b_{41}	b_{42}	a_3	a_4	a_5
$R_5(X,Q)$	a_1	b_{52}	b_{53}	b_{54}	a_5

$Y \to Z$

	$X(A_1)$	$Y(A_2)$	$Z(A_3)$	$W(A_4)$	$Q(A_5)$
$R_1(X,W)$	a_1	b_{12}	b_{13}	a_4	b_{15}
$R_2(X,Y)$	a_1	a_2	b_{13}	b_{24}	b_{25}
$R_3(Y,Q)$	b_{31}	a_2	b_{33}	b_{34}	a_5
$R_4(Z,W,Q)$	b_{41}	b_{42}	a_3	a_4	a_5
$R_5(X,Q)$	a_1	b_{52}	b_{53}	b_{54}	a_5

$Z \to W$

	$X(A_1)$	$Y(A_2)$	$Z(A_3)$	$W(A_4)$	$Q(A_5)$
$R_1(X,W)$	a_1	b_{12}	b_{13}	a_4	b_{15}
$R_2(X,Y)$	a_1	a_2	b_{13}	a_4	b_{25}
$R_3(Y,Q)$	b_{31}	a_2	b_{33}	a_4	a_5
$R_4(Z,W,Q)$	b_{41}	b_{42}	a_3	a_4	a_5
$R_5(X,Q)$	a_1	b_{52}	b_{53}	a_4	a_5

WQ → Z

	X(A1)	Y(A2)	Z(A3)	W(A4)	U(A5)
R1(X,W)	a1	b12	b13	a4	b15
R2(X,Y)	a1	a2	b13	a4	b25
R3(Y,U)	b21	a2	a3	a4	a5
R4(Z,W,U)	b41	b42	a3	a4	a5
R5(X,U)	a1	b52	a3	a4	a5

ZU → X

	X(A1)	Y(A2)	Z(A3)	W(A4)	U(A5)
R1(X,W)	a1	b12	b13	a4	b15
R2(X,Y)	a1	a2	b13	a4	b25
R3(Y,U)	a1	a2	a3	a4	a5
R4(Z,W,U)	a1	b42	a3	a4	a5
R5(X,U)	a1	b52	a3	a4	a5

contains entire ai's

Since R3 row contains all ai's, the decomposition is lossless

2) Relation R(X, Y, W, Z, P, U). ~~F = {}~~

F = {XY → W, XW → P, PU → Z, XY → U}

R1(Z, P, U) R2(X, Y, Z, P, U)

1) XY → W, XW → P (No Reflexivity ∴ Leave it)
PU → Z (No changes)

	X(A1)	Y(A2)	W(A3)	Z(A4)	P(A5)	U(A6)
R1(Z,P,U)	b11	b12	b13	a4	a5	a6
R2(X,Y,Z,P,U)	a1	a2	b23	a4	a5	a6

∴ Lossy