Homework 6

8.28:

relation r such as:

A	B	C	D	E
a_1	b_1	c_1	d_1	e_1
a_2	b_2	c_1	d_2	e_2

Will result $\Pi_{A,B,C}(r) \bowtie \Pi_{C,D,E}(r)$ as:

A	B	C	D	E
a_1	b_1	c_1	d_1	e_1
a_1	b_1	c_1	d_2	e_2
a_2	b_2	c_1	d_1	e_1
a_2	b_2	c_1	d_2	e_2

which proves that (A,B,C), (C,D,E) are lossy decomposition

Practice Problem 8.1:

if we do $R_1 \cap R_2$, we will have:

$(A,B,C) \cap (A,D,E) = (A)$

based on FD $A \to BC$, we will have $\{A,B,C\}$

Therefore, $(A,B,C) \cap (A,D,E) \Rightarrow (A,B,C)$

shows that (A,B,C), (A,D,E) are lossless decomposition

8.29:

a. Starts with $B \to D$, we had $\{B, D\}$, then

$D \to A$ leads to $\{B, D, A\}$, then

$A \to BCD$ leads to $\{A, B, C, D\}$, then

$BC \to DE$ leads to $\{A, B, C, D, E\}$

Therefore, B^+ is $\{A, B, C, D, E\}$

b. $\because A \to BCD$ $\therefore A \to ABCD$

and $BC \to DE$

$\therefore ABCD \to DE$ by applying Reflexivity Rule

$\therefore ABCD \to ABCDE$

$\therefore A \to ABCDE$ by applying Transitivity Rule

$\therefore AF \to ABCDEF$ by applying Augmentation Rule

Therefore AF is a superkey

d. Because of the dependencies on the canonical cover,

we had relations : (A,B,C), (B,D,E), (D,A)

$\because$ F doesn't appear at initial Functional Dependencies,

and F are not included in the above newly formed relations,

we need one more relation with super key AF

Therefore, the 3NF decomposition of r are relations:

(A,B,C), (B,D,E), (D,A), (A,F)

e. Because all of the dependencies violate BCNF : $A^+ : \{A,B,C,D\}$

$BC^+ : \{A,D,E\}$

$B^+ : \{A,B,C,D,E\}$

$D^+ : \{A,B,C,D,E\}$

So decompose the original relation based on $D \to A$, we had:

(B,C,D,E,F), (D,A)

To further decompose (BCDEF) because it still violates BCNF, we had

(B,C,F), (B,C,D,E), (D,A)

and now they are all in the BCNF

Therefore, the BCNF decomposition of r are relations:

(B,C,F), (B,C,D,E), (D,A).