Homework 6

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8.1

A decomposition {R1, R2} is a lossless-join decomposition if R1 ∩ R2 → R1 or R1 ∩ R2 → R2. Let R1 = (A, B, C), R2 = (A, D, E), and R1 ∩ R2 = A. Since A is a candidate key, Therefore R1 ∩ R2 → R1.

8.13

The dependency B → D is not preserved. F1 contains no dependencies with D on the right side of the arrow. F2 contains no dependencies with B on the left side of the arrow. Therefore for B → D to be preserved there must be an FD B → a in F+1 and a → D in F+2 (so B → D would follow by transitivity). Since the intersection of the two schemes is A, a = A. Observe that B → Ais not in F+ 1 since B+ = BD.

8.19

From Exercise 8.6, we know that B → D is nontrivial and the left hand side is not a superkey. By the algorithm of Figure 8.11 we

derive the relations {(A, B, C, E), (B, D)}. This is in BCNF.

8.20

First we note that the dependencies given in Practice Exercise 8.1 form a canonical cover. Generating the schema from the algorithm of Figure 8.12 we get R' = {(A, B, C), (C, D, E), (B, D), (E, A)}. Schema (A, B, C) contains a candidate key. Therefore R' is a 3NF dependency-preserving lossless-join decomposition. Note that the original schema R = (A, B, C, D, E) is already in 3NF. Thus, it was not necessary to apply the algorithm as we have done above. The single original schema is trivially a lossless join, dependency-preserving decomposition.

8.28

(A, B, C, D, E)

A	B	C	D	E
a1	b1	c1	d1	e1
a2	b2	c2	d2	e2
a3	b3	c3	d3	e3

(A, B, C)

A	B	C
a1	b1	c1

a2	b2	c2
a3	b3	c3

(C, D, E)

C	D	E
c1	d1	e1
c2	d2	e2
c3	d3	e3

The decomposition is not a lossless-join decomposition.