Database Systems HW 2 Extra Credit

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Question 2

You are given the following set of functional dependencies for relation R(A, B, C, D, E, F, G, H):

$$F = \{A \to DGH, \; BD \to EG, \; FH \to BC, \; D \to CEF\}$$

Is the following decomposition lossless?

$$R_1(B, E, F)$$

$$R_2(A, B)$$

$$R_3(F, G, H)$$

$$R_4(B, C, D, G, H)$$

Show your work with the chase algorithm.

Solution

Initial Chase Table:

	A	B	C	D	E	F	G	H
R_1	a_1	b	c_1	d_1	e	f	g_1	h_1
R_2	a	b	c_2	d_2	e_2	f_2	g_2	h_2
R_3	a_3	b_3	c_3	d_3	e_3	f	g	h
R_4	a_4	b	c	d	e_4	f_4	g	h

Apply $A \to DGH$
Row 2 has A:

1

	A	B	C	D	E	F	G	H
R_1	a_1	b	c_1	d_1	e	f	g_1	h_1
R_2	a	b	c_2	d	e_2	f_2	g	h
R_3	a_3	b_3	c_3	d_3	e_3	f	g	h
R_4	a_4	b	c	d	e_4	f_4	g	h

Apply $BD \rightarrow EG$
Rows 2,4 share B and D:

	A	B	C	D	E	F	G	H
R_1	a_1	b	c_1	d_1	e	f	g_1	h_1
R_2	a	b	c_2	d	e	f_2	g	h
R_3	a_3	b_3	c_3	d_3	e_3	f	g	h
R_4	a_4	b	c	d	e	f_4	g	h

Apply $FH \rightarrow BC$
Row 3 has F and H:

	A	B	C	D	E	F	G	H
R_1	a_1	b	c_1	d_1	e	f	g_1	h_1
R_2	a	b	c_2	d	e	f_2	g	h
R_3	a_3	b	c	d_3	e_3	f	g	h
R_4	a_4	b	c	d	e	f_4	g	h

Apply $D \rightarrow CEF$
Rows 2 and 4 share D:

	A	B	C	D	E	F	G	H
R_1	a_1	b	c_1	d_1	e	f	g_1	h_1
R_2	a	b	c	d	e	f	g	h
R_3	a_3	b	c	d_3	e_3	f	g	h
R_4	a_4	b	c	d	e	f	g	h

Row 2 is now:

$$(a, b, c, d, e, f, g, h)$$

Row without subscripts exists.
Therefore, decomposition is **lossless**.