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Test for Lossless Join Property:

We can apply Chase's algorithm to check whether a decomposition is Lossless or not.

1.

Let us first consider **PASSENGER** table. It has been decomposed into **PASSENGER1, PASSENGER2** and **PASSENGER3.**

PASSENGER1 (PID, PASSPORTNO)

PASSENGER2(PASSPORTNO, FNAME, M, LNAME, ADDRESS, PHONE, AGE, SEX)

PASSENGER3 (PID, FLIGHT_CODE)

Functional Dependencies are:

PASSPORTNO → { FNAME, M, LNAME, ADDRESS, PHONE, AGE, SEX }

PID → FLIGHT_CODE

Now filling the table according to the algorithm:-

	PID	PASSPORTNO	FNAME	M	LNAME	ADDRESS	PHONE	AGE	SEX	FLIGHT_CODE
PASSENGER1	**A_1**	**A_2**	B_{13}	B_{14}	B_{15}	B_{16}	B_{17}	B_{18}	B_{19}	$B_{1\ 10}$
PASSENGER2	B_{21}	**A_2**	A_3	A_4	A_5	A_6	A_7	A_8	A_9	$B_{2\ 10}$
PASSENGER3	**A_1**	B_{32}	B_{33}	B_{34}	B_{35}	B_{36}	B_{37}	B_{38}	B_{39}	A_{10}

	PID	PASSPORTNO	FNAME	M	LNAME	ADDRESS	PHONE	AGE	SEX	FLIGHT_CODE
PASSENGER1	**A_1**	**A_2**	~~B_{13}~~ A_3	~~B_{14}~~ A_4	~~B_{15}~~ A_5	~~B_{16}~~ A_6	~~B_{17}~~ A_7	~~B_{18}~~ A_8	~~B_{19}~~ A_9	~~$B_{1\ 10}$~~ A_{10}
PASSENGER2	B_{21}	**A_2**	A_3	A_4	A_5	A_6	A_7	A_8	A_9	$B_{2\ 10}$
PASSENGER3	**A_1**	B_{32}	B_{33}	B_{34}	B_{35}	B_{36}	B_{37}	B_{38}	B_{39}	A_{10}

Now we can see an entire row contains only alpha (A) values. According to the algorithm we conclude that the decomposition is Lossless.

2.

Let us consider **TICKET** table. It has been decomposed into **TICKET1**. **TICKET2**, and **TICKET3**.

TICKET1 (TICKET_NUMBER, SOURCE, DESTINATION, DATE_OF_BOOKING, DATE_OF_TRAVEL, SEATNO, CLASS, DATE_OF_CANCELLATION, PID, PASSPORTNO)

TICKET2 (DATE_OF_BOOKING, SOURCE, DESTINATION, CLASS, PRICE)

TICKET3 (DATE_OF_CANCELLATION, SURCHARGE)

Functional Dependencies are:

{ DATE_OF_BOOKING, SOURCE, DESTINATION, CLASS } → PRICE

DATE_OF_CANCELLATION → SURCHARGE

Now filling the table according to the algorithm we get final table as:-

	TICKET_NUMBER	**SOURCE**	**DESTINATION**	**DATE_OF_BOOKING**	**DATE_OF_CANCELLATION**	**DATE_OF_TRAVEL**	**SEATNO**	**CLASS**	**SURCHARGE**	**PID**	**PASSPORTNO**	**PRICE**
TICKET1	A	**A**	**A**	**A**	**A**	A	A	**A**	~~B~~ A	A	A	~~B~~ A
TICKET2	B	**A**	**A**	**A**	B	B	B	**A**	B	B	B	A
TICKET3	B	B	B	B	**A**	B	B	B	A	B	B	B

So the decomposition is **Lossless.**

3.

Let us consider **EMPLOYEE** table. It has been decomposed into **EMPLOYEE1** and **EMPLOYEE2**.

EMPLOYEE1 (SSN, FNAME, M, LNAME, ADDRESS, PHONE, AGE, SEX, JOBTYPE, ASTYPE, ETYPE, SHIFT, POSITION, AP_NAME)

EMPLOYEE2(JOBTYPE, SALARY)

Functional Dependencies are:

JOBTYPE → SALARY

SSN → { FNAME, M, LNAME, ADDRESS, PHONE, AGE, SEX, PHONE, ADDRESS }

Now filling the table according to the algorithm:-

	SSN	**FNAME**	**M**	**LNAME**	**ADDRESS**	**PHONE**	**AGE**	**SEX**	**JOBTYPE**	**ASTYPE**	**ETYPE**	**SHIFT**	**SALARY**	**AP_NAME**
EMPLOYEE1	A	A	A	A	A	A	A	A	**A**	A	A	A	~~B~~ A	A
EMPLOYEE2	B	B	B	B	B	B	B	B	**A**	B	B	B	A	B

So this decomposition is also **Lossless**.