HW8

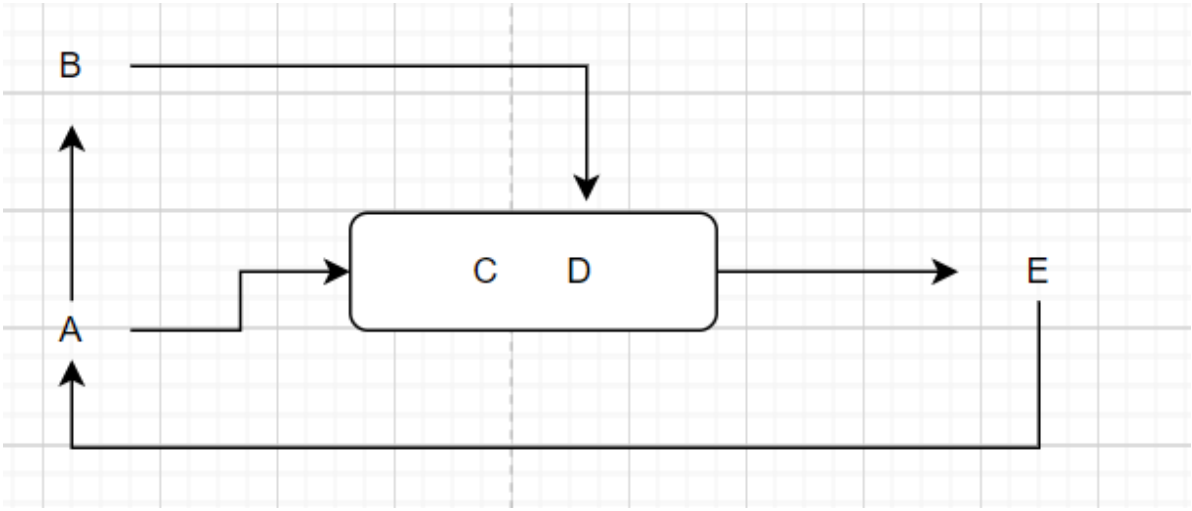
7.1

$$
\begin{gathered}
if\ and\ only\ if \\
(R_1 \wedge R_2 = R_1)\ OR\ (R_1 \wedge R_2 = R_2) \\
R_1 = (A, B, C) \\
R_2 = (A, D, R) \\
R_1 \wedge R_2 = A \\
A->BC <=> A->B\,, A->C \\
A->B\,, B->D <=> A->D \\
A->CD <=> A->D\,, A->C \\
A->CD\,, CD->E <=> A->E \\
A->E, E->A <=> A->A \\
So\ A\ is\ a\ candidate\ key\ and\ it's\ a\ lossless-join
\end{gathered}
\tag{1}
$$

7.13

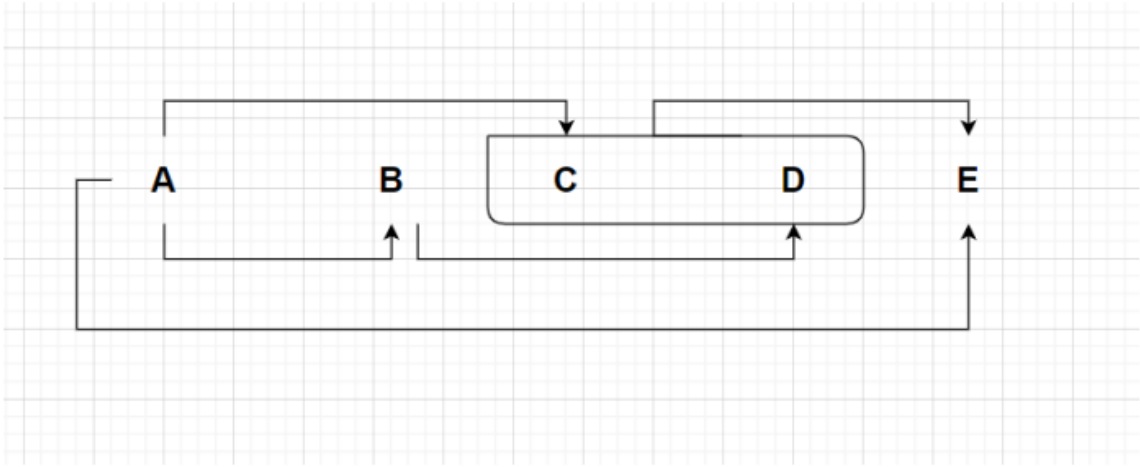
$$
\begin{gathered}
B->D\ is\ not\ perserved \\
the\ restriction\ of\ (A,\ B,\ C)\ is \\
A->B\ A->A\ A->C \\
B->B\ C->C \\
the\ restriction\ of\ (C, D, E)\ is \\
C->D\ C->C\ C->E\ D->D\ D->E \\
so\ it's\ impossible\ for\ B->D
\end{gathered}
\tag{1}
$$

7.21



$$
\begin{gathered}
A->BC \\
CD->E \\
B->D \\
(A, B, C)(B, D)(C, D, E)(E, A)
\end{gathered}
\tag{2}
$$

7.22



$$
\begin{gathered}
A->BC \\
CD->E \\
B->D \\
(A,B,C)\ (B,D)\ (C,D,E)\ (E,A)
\end{gathered}
\tag{3}
$$

7.30

a.

$$
B^{+}=ABCED \tag{3}
$$

b.

$$
\begin{gathered}
A->BCD\ A->A \\
BC->DE \\
\because A->ABCDE \\
\therefore AF->ABCDEF
\end{gathered}
\tag{4}
$$

c.

$$
\begin{gathered}
A->BCD\ <=>\ A->B \\
A->B\,,\ B->D\ <=>A->D \\
\because A->BCD ==> A->BC \wedge\ B->D \\
\therefore\ BC->DE ==> BC->E \because B->E \\
\therefore \begin{cases} A->BC \\ B->DE \\ D->A \end{cases}
\end{gathered}
\tag{5}
$$

d.

$$
\begin{gathered}
r_1\{A,B,C\} \\
r_2\{B,D,E\} \\
r_3\{D,A\} \\
r_4\{A,F\} \\
\textit{We could add a } r_4\{A,F\} \textit{ to make it good}
\end{gathered}
\tag{6}
$$

We could add a $r_4\{A, F\}$ to make it good

e.

$$A->BCD ==> \begin{cases} r_1\{A,B,C,D\} \\ r_2\{A,E\} \\ r_3\{A,F\} \end{cases} \tag{7}$$