

Task 1

A)

$\{C\} \rightarrow \{B\}$

We use transitivity and decomposition rules.

As $\{C\} \rightarrow \{A\}$ (FD2 Decomposition)

and $\{A\} \rightarrow \{B\}$ (FD1 Transitivity and Decomposition)

Therefore $\{C\} \rightarrow \{B\}$ is true

B)

$\{A,E\} \rightarrow \{F\}$

Our steps

$\{A\} \rightarrow \{C\}$ (FD1 Decomposition)

$\{C\} \rightarrow \{D\}$ (FD2 Decomposition)

therefore by transitivity

$\{A\} \rightarrow \{D\}$

$\{A,E\} \rightarrow \{F\}$ (FD3 Transitivity with FD2 and FD1)

$\{A,E\} \rightarrow \{F\}$ therefore is true

Task 2

A) $\{A,B,C,D\}$

B) $\{A,B,C,D,E\}$

Task 3

A) Candidate keys are: $\{A, B\}$ and $\{A, D\}$ as they both are the smallest super keys

B) We can see that FD2, and FD3 violate BCNF as $\{A,B\}$ and $\{A, D\}$ are the only minimal super keys

C) Since FD 2 and 3 violate BCNF we have decomposed these FDs.

For FD2 we make a new relation $R_2(E,F)$ with primary key $\{E\}$.

Then the rest is $R_1(A, B, E, D)$.

This is not BCNF so we split it to $R_1(A, E)$ with primary key $\{A\}$ and $R_3(D, B)$ with primary key $\{D\}$.

Task 4

A) FD3 does not comply with BCNF.

This because, $X = \{C\}$, $X^+ = \{C, D\}$ which is not in R

B) Splitting the schema into $R_2(C, D)$ with primary key $\{C\}$

Then the rest of the attributes form $R_1(A, B, C, E)$

FD4: {A, B, C} → {E}