Task 1.

a) $\{C\} \Rightarrow \{B\}$.

We know that

FC2: $\{C\} \Rightarrow \{A, D\}$

↓ decomposition.

$\{C\} \Rightarrow \{A\}$

+

$\{AE\} \Rightarrow \{BC\}$

↓ Transitivity.

$\{C\} \Rightarrow \{B, C\}$

b) $\{AB\} \Rightarrow \{F\}$

$\{A\} \Rightarrow \{B, C\}$

↓ augmentation

$\{AE\} \Rightarrow \{BCE\}$

↓ decomposition

$\{AE\} \Rightarrow \{C\}$ $\{AE\} \Rightarrow \{E\}$

+

$\{C\} \Rightarrow \{AD\}$

↓ transitivity

$\{AE\} \Rightarrow \{AD\}$

+ Union

$\{AB\} \Rightarrow \{ADE\}$

↓ decomposition

$\{ABE\} \Rightarrow \{DE\}$

+

$\{DE\} \Rightarrow \{F\}$

↓ transitivity

$\{AE\} \Rightarrow \{F\}$.

task2

a) $X = \{A\}$

$X^+ = \{A\}$

FD1: $\{A\} \Rightarrow \{BC\}$

$Y = \{A\}$, $Z = \{BC\} \Rightarrow Y$ in X^+, Z not in X^+

$X^+ = \{A\} \cup \{BC\} \Rightarrow \{ABC\}$

FD2: $Y = \{C\}$, $Z = \{AD\}$

Y in X^+, Z not in X^+

$X^+ = \{ABC\} \cup \{AD\} \rightarrow \{ABCD\}$.

b) $X = \{CE\}$

$X^+ = \{CE\}$

FD2: $Y = \{C\}$, $Z = \{AD\}$

Y in X^+, Z not in X^+

So $X^+ = \{CE\} \cup \{AD\} \rightarrow \{ACDE\}$.

FD3: $\{DE\} \Rightarrow \{F\}$

$Y = \{DE\}$, $Z = \{F\}$.

Y in X^+, Z not in X^+

So $X^+ = \{ACDE\} \cup \{F\} \Rightarrow \{ACDEF\}$

task3

a) Determine the candidate keys (cks) for R

According to trick one, A should be kept.

According to trick two, & A

So cks should be {AB} {AD} {AE}

b) {F}⇒{F}, {D}⇒{B} violate the condition

c) R(ABCDEF)

{F}⇒{F} violat the BCNF condition

R1 {ABCDE}

FD: {AB}⇒{CDE}

{D}⇒{B}

cks: {AB} {AD}

we can see {D}⇒{B} violate the BCNF condition.

R2 {EF}

FD: {E}⇒{F}

R4 {ACDE}

FD: {AD}⇒{CE}

ck: {AD}

R5 {DB}

FD: {D}⇒{B} ck: {D}

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task4

R(A, B, C, D, E) B C E

ck: {BC}

FD3: {C}⇒{D} violate the BCNF condition.

R2 {ABCE}

FD: {BC}⇒{AE}

ck: {BC}

R3 {CD}

FD: {C}⇒{D} ck: C