CSC343 - Assignment 3 Dependcies

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Question 1

(a)

Question 2

Relation T contains attributes CDEFGHIJ and FDs
$S_T = \{C \to EH, DEI \to F, F \to D, EH \to CJ, J \to FGI\}$

(a)

- $C^+ = CDEFGHIJ$ so $C \to EH$ does not violate BCNF
- $DEI^+ = DEIF$ so $DEI \to F$ does violate BCNF
- $F^+ = FD$ so $F \to D$ does violate BCNF
- $EH^+ = CDEFGHIJ$ so $EH \to CJ$ does not violate BCNF
- $J^+ = JFGID$ so $J \to FGI$ does violate BCNF

(b)

- Decompose T using FD $DEI \rightarrow F$. $DEI^+ = DEIF$, so this yields two relations $R_1 = DEFI$ and $R_2 = CDEGHIJ$
- Project the DFs onto $R_1 = DEFI$.

D	E	F	I	closure	FDs
✓				$D^+ = D$	nothing
	✓			$E^+ = E$	nothing
		✓		$F^+ = FD$	$F \rightarrow D$; violates BCNF; abort

We must decompose R_1 further.

- Decompose R_1 using FD $F \rightarrow D$. so this yields two relations $R_3 = FD$ and $R_4 = FEI$
- Project the FDs onto $R_3 = FD$.

F	D	closure	FDs
✓		$F^+ = FD$	$F \rightarrow D$
	✓	$D^+ = D$	nothing

- Project the FDs onto $R_4 = FEI$.

F	E	I	closure	FDs
✓			$F^+ = FD$	nothing
	✓		$E^+ = E$	nothing
		✓	$I^+ = I$	nothing
✓	✓		$FE^+ = FED$	nothing
✓		✓	$FI^+ = FI$	nothing
	✓	✓	$EI^+ = EI$	nothing

- Return to $R_2 = CDEGHIJ$ and prodject the FDs onto it.

C	D	E	G	H	I	J	closure	FDs
✓							$C^+ = CDEGHIJ$	nothing
	✓						$D^+ = D$	nothing
		✓					$E^+ = E$	nothing
			✓				$G^+ = G$	nothing
				✓			$H^+ = H$	nothing
					✓		$I^+ = I$	nothing
						✓	$J^+ = JFGID$	$J \rightarrow IDG$

- Decompose R_2 using FD $J \rightarrow IDG$. so this yields two relations $R_5 = JIDG$ and $R_6 = CEHJ$
- Project the FDs onto $R_5 = JIDG$.

J	I	D	G	closure	FDs
✓				$J^+ = JFGID$	$J \rightarrow IDG$; dont need to consider super-sets of J
	✓			$I^+ = I$	nothing
		✓		$D^+ = D$	nothing
			✓	$G^+ = G$	nothing
	✓	✓		$ID^+ = ID$	nothing
	✓		✓	$IG^+ = IG$	nothing
		✓	✓	$DG^+ = DG$	nothing

- Project the FDs onto $R_6 = CEHJ$.

C	E	H	J	closure	FDs
✓				$C^+ = CEHJFGI$	$C \rightarrow EHJ$; dont need to consider super-sets of C
	✓			$E^+ = E$	nothing
		✓		$H^+ = H$	nothing
			✓	$J^+ = J$	nothing
	✓	✓		$EH^+ = CEHJFGID$	$EH \rightarrow CEHJFGID$
	✓		✓	$EJ^+ = EJFGID$	nothing
		✓	✓	$HJ^+ = HJFGID$	nothing

So relation T containing attributes CDEFGHIJ decomposes in to relations

- $R_3 = FD$
  FDs = $\{F \rightarrow D\}$
- $R_4 = EFI$
  FDs = $\{\}$
- $R_5 = DGIJ$
  FDs = $\{J \rightarrow DGI\}$
- $R_6 = CEHJ$
  FDs = $\{EH \rightarrow CJ, C \rightarrow EH\}$