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Assignment #2

#1 $R(A, B, C, D, E)$

① $A \rightarrow B$
② $E \rightarrow A$
③ $CE \rightarrow D$

#1 Since CE is not on the RHS of any FD we know that CE must be in any key. Lets start with CE.

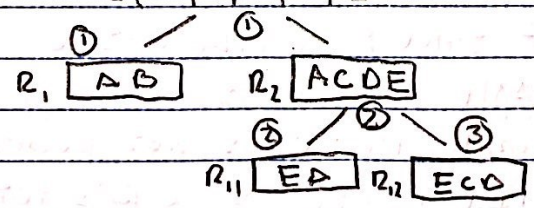
$CE \xrightarrow{②} ACE \xrightarrow{③} ACDE \xrightarrow{①} ABCDE$

Thus, CE is a superkey & since CE must be contained in any key. Therefore CE is a minimal key.

#2 ① $A \rightarrow A$ No FD apply ① is not redundant
② $E \rightarrow E$ No FD apply ② is not redundant
③ $CE \xrightarrow{②} ACE \xrightarrow{①} ABCE$ we can't reach D ③ is not redundant

Thus, {①②③} is a minimal basis

#3 $R(A, B, C, D, E)$



* All FD's in R_1, R_{11}, R_{12} are super keys

Thus $R_1(A, B)$, $R_{11}(E, A)$, & $R_{12}(E, C, D)$ are all in BCNF.

#4

① A minimal basis was found in #1,2

② Fragments created from this basis

$R_1(AB)$

$R_2(EA)$ ✗ No fragment is not contained

$R_3(CED)$ in another

③ The key CE is contained in R_3

Thus R_1, R_2, R_3 are in 3NF

#2 S(C, E, J, P, R, T)

① J → P

② T → E

③ J → C

④ JT → R

⑤ C → P

#1 since JT is not on the RHS of any FD we know it must be contained with in any key. Lets start with JT

$JT \xrightarrow{3} CJT \xrightarrow{1} CJPT \xrightarrow{2} CEJPT \xrightarrow{4} CEJPRT$

Thus, JT is a superkey since any key must contain JT we know that JT must be a minimal key.

#2 ① $J \xrightarrow{3} JC \xrightarrow{5} JCP$ since P is on the RHS ① is Redundant

② T → T No FD apply, thus ② is not Redundant

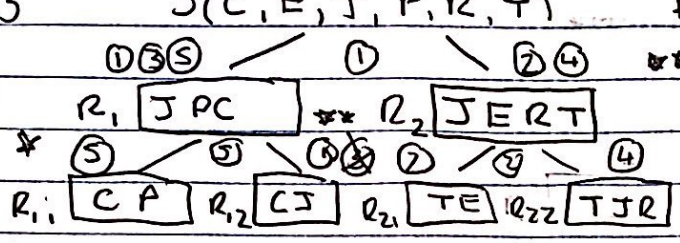
③ J → J No FD apply, thus ③ is not Redundant

④ $JT \xrightarrow{2} JTE \xrightarrow{3} JTEC \xrightarrow{5} JTECP$ since R is not on RHS ④ is not Redundant

⑤ C → C No FD apply, thus ⑤ is not Redundant

Thus, {②, ③, ④, ⑤} is a minimal basis

#3 S(C, E, J, P, R, T)



* ⑤ Not superkey in R_1

** ③ is not perserved in R_{12} thus S can't be put in BCNF

#4 ① A minimal basis was formed in #2.2

② Fragments created from this basis

$R_1(T, E)$

$R_2(J, C)$ No fragment is contained in another fragment

$R_3(J, T, R)$

$R_4(C, P)$

③ The key {JT} is contained in R_3

Thus, R_1, R_2, R_3, R_4 is in 3NF.