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Task 1:

FD1: A -> B,C

FD2: C -> A,D

FD3: D,E -> F

1. Find C -> B

FD4: A -> B (decomposition FD1)

FD5: C-> A (decomposition FD2)

FD6: C-> B (transitivity FD4 and FD5)

1. A,E -> F

FD7: A -> C (decomposition FD1)

FD8: C -> D (decomposition FD2)

FD9: A -> D (transitivity FD7, FD8)

FD10: AE -> DE (augmentation FD7 by E)

FD11: AE -> F (transitivity FD10, FD3)

Task 2:

1. X = {A} -> FD1 {ABC} -> FD2 {ABCD}->FD3 no E {ABCD}: X+ = {ABCD}
2. X = {CE} -> FD2 {ACDE} -> FD3 {ACDEF} -> FD1 {ABCDEF} X+ = {ABCDEF}

Task 3:



A must be in a candidate key because it doesn’t exist in right side of FD equations

C, F can’t be in a candidate key because they don’t exist in left side of equations

A – doesn’t lead to anything so not a candidate key

A,B -> FD1 {ABCDEF} : can be superkey and candidate key

AD -> FD3 {ABD} -> FD1 {ABCDEF}: can be superkey and candidate key

AE -> FD2 {AEF} cant be candidate key or superkey

Candidate keys: AB and AD

FD2 and FD3 violates BCNF because E F are not in the superkey



FD2 violates BCNF

Decomposing:

R1(ABCDE)

F4 AB -> CDE, F2 D -> B| not BCNF because of F2

Candidate keys:

AB -> F4 ABCDE

AD -> F2 ADB -> F4 ABCDE

R2(EF)

F3 E-> F | BCNF

Candidate key:

E

Decomposing R1 because of D->B

R11(DB)

F2 D->B| BCNF

Candidate keys:

D -> F1 DB

R12(ACDE)

F5 AD -> AB| F6 AD-> CDE | F7 AD -> CE | BCNF

Candidate keys:

AD -> F7 ACDE

Task 4

Candidate keys for R

B and C must be in a candidate keys, E cant be in a candidate key,

BC -> FD3 BCD -> FD2 ABCDE candidate key, superkey

ABC -> FD1 ABCDE candidate key, superkey

BCD -> FD2 ABCDE candidate key , superkey

C is not a superkey, so R not a BCNF

Decomposing using FD3

R1(CD)

FD3 C -> D |BCNF

Candidate key:

C

R2(ABCE)

FD1 ABC-> E| FD4 BC -> BCD| FD5 BC -> AE

Candidate keys:

BC -> ABCE super key, candidate key

ABC -> ABCE super key, candidate key

BCNF