CS4350 Database Systems HW#4

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Given the schema S= < { A,B,C,D,E,F, G,H}, FD>

Where FD consists the following dependencies:
AF → BC
A → F
E →C
C→ D
D → H
E → H
C → H
HC → D
G → H

i. Find a minimal cover for the above schema
Rules – Singleton RHS, no extraneous solution on LHS, no redundant functional dependencies
Solution:
A → B
A → C
A → F
E →C
C→ D
D → H
G → H

Step 1:

A+	F+
AFBC	F

Step 2:

A+	F+
AF	F

Step 3:

H+	C+
H	CH

Step 4:
A+
ACFDH (no B so keep A → B)
Step 5:
A+
BF (no C so keep A → C)
Step 6:
A+

ABCDH (no F so keep A → F)
Step 7:
E+
EH (no C so keep E → C)
Step 8:
C+
CH (no D so keep C → D)
Step 9:
D+
D (no H so keep D → H)
Step 10:
E+
ECDH (has H so delete E → H)
Step 11:
C+
CDH (has H so delete C → H)
Step 12:
G+
G (no H so keep G → H)

ii. Find a key for above schema
Minimal Cover:
A → B
A → C
A → F
E →C
C→ D
D → H
G → H

Keys are {A,E,G}

iii. Find a third normal form decomposition.
R1 = {A, B, C, F}
R2 = {E, C}
R3 = {C, D}
R4 = {D, H}
R5 = {G, H}
R6 = {A, E, G}

iv. Find a BCNF decomposition
3NF relationship also satisfies BCNF by being in 3rd normal form and every determinant is a candidate key. No changes from iii
R1 = {A, B, C, F}

R2 = {E, C}
R3 = {C, D}
R4 = {D, H}
R5 = {G, H}
R6 = {A, E, G}

v. Determine whether the following decompositions are lossy or loss-less .
R1= {A,B,C,D} R2={ B,E,F,G,H}
Lossless since B is the only common attribute and it doesn't contain all candidate keys of {A, E, G}

R1={ A,B,C,F} R2={ A, E,D,G,H}
Lossless since A is the only common attribute and A only doesn't contain all the candidate keys of {A, E, G}