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

1. 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)

1. 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}

1. 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}

1. 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}

1. 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}