CPSC 304: Introduction to Relational Algebra
Normalization 2 In-Class Exercise Solution

Consider a relation S(G, H, J, K). The following FDs are given:
G → H
JK→G
H→K

Is S in BCNF? Why or why not?

If it is not in BCNF:

- Decompose into BCNF as covered in class.
- Circle the relations in your final answer.
- Underline the keys in your final answer.

Show your work. Write your answer here:

Closures:
G^+ = {G, H, K}
JK^+ ={J, K, G, H}
H^+ = {H, K}

G→H violates BCNF (as does H→K and G→K), so pick one to decompose on. We arbitrarily choose to decompose on G→H. (Note: if you chose to decompose on H→K or some other FD that violates BCNF first, you will get a different answer. That's fine.)

Step 1: Decompose on G → H.
R_1(G,H), R_2(G,J,K)

R1 is in BCNF (all two attribute relations are in BCNF).

Step 2: Decompose on G → K. (The closure of G tells us that G → H and G → K.)
In R_2, G→K violates BCNF, so you need to decompose again
R_3(G,K), R_4(G,J)

We cannot decompose on JK → G or H → K because out of R_1, R_3, and R_4, there is no single relation that contains all of JKG or HK.

The **final answer** is: R_1(G,H), R_3(G,K), R_4(G,J).