CSCI3170 Short Assignment #3  
(Deadline: Nov 15, 23:59)

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1. Consider the following relation and functional dependencies:

R(a,b,c,d)

F = {a🡪b, c🡪d}

1. Give a BCNF decomposition of R. Please show your steps.

Ans:

abcd

acd

ab

ac

cd

So a BCNF decomposition of R is {(a,b), (c,d), (a,c)}

1. Prove that your decomposition is a lossless-join decomposition.

Ans:  
Note that ac is a superkey for R. We have attribute sets ac, so by theorem, the decomposition {(a,b), (c,d), (a,c)} is a lossless-join decomposition.

1. Consider the following relation and functional dependencies:

R(a,b,c,d,e)

F = {ab🡪cd, c🡪d}

1. List the candidate key of R

Ans:

abe

1. Find the canonical cover of F

Ans:

R = (a,b,c,d,e)

F = {ab🡪cd, c🡪d}

Let F’ = {ab🡪c, c🡪d}

We compute the closure of ab under F’:

(ab)+

= abc (ab🡪c)

= abcd

So d is extraneous in F.

F’ = {ab🡪c, c🡪d} is a canonical cover for F.

1. Give a 3NF decomposition of R. Briefly explain your answer.  
   Ans:

Fc = {ab🡪c, c🡪d}

Consider ab🡪c, we add a schema abc

Consider c🡪d, we add a schema cd

Since abc and cd are not candidate key of R, we add a schema abe.

A 3NF decomposition of R is {(a,b,c), (c,d), (a,b,e)}.