CSCI3170 Short Assignment #3 (Solution)

Name: Pass / Fail

Student ID:

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

ab

acd

cd

ac

Therefore, R(a,b,c,d) is decomposed into R1(a,b), R2(c,d) and R3(a,c) .

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

Ans:

Consider the decomposition in two steps:

Step 1: Decompose R(a,b,c,d) into R1(a,b) and R’(a,c,d)

Since the common attribute between R1 and R’ is a, and a is the key of R1, the decomposition is lossless-join.

Step 2: Decompose R’(a,c,d) into R2(c,d) and R3(a,c)

Since the common attribute between R2 and R3 is c, and c is the key of R2, the

decomposition is lossless-join

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:

The key is abe

1. Find the canonical cover of F

Ans:

Fc={ab🡪c, c🡪d}

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

Ans:

For ab🡪c, create R1(a,b,c)

For c🡪d, create R2(c,d)

As the key abe is not contained in R1 and R2, R3(a,b,e) is created.

Therefore, R(a,b,c,d,e) is decomposed into R1(a,b,c), R2(c,d), and R3(a,b,e).