Goran Somic

CSC 453

Homework 3

**PART A: FUNCTIONAL DEPENDENCIES**

A-1 TD & KEYS

1. Yes, we can infer NP🡪LM from F because NP🡪LNOMP therefore NP🡪LM.
2. No, we cannot infer NQ 🡪 LO from F because NQ 🡪 NQO and does not extend to LO.

A-2 KEYS

1. BEA, BEC, BED
2. Candidate key is AEBF and the superkeys are:

AEBF, AEBCD, AEBFC, AEBFD, AEBFCD

A-3 MINIMAL COVER

Start with:

A🡪BC, AB🡪D, C🡪AD,D🡪B

Decompose to:

A🡪B, A🡪C, AB🡪D, C🡪A, C🡪D, D🡪B

Once we do this we can see that we can remove A🡪B leaving us with:

A🡪C, AB🡪D, C🡪A, C🡪D, D🡪B

Then we proceed to decompose the left-hand side relations

A🡪C, A🡪D, C🡪A, C🡪D

A🡪B is transferred to A🡪D

Then A🡪C and C🡪D, we can delete A🡪D

So we are left with minimal cover of:

**{A🡪C, C🡪AD, D🡪B}**

A-4 EQUIVALENCE

* FD1 is equivalent to FD3 because coverage exists between both
* FD1 is NOT equivalent to FD2 since FD1 is not covering FD2 in the case that

D🡪BE is not equal to D🡪BEG

B-1 DEPENDECY PRESERVATION

First, we start with getting minimum cover

Of y🡪x, y🡪z, yz🡪w, x🡪w, we replace yz🡪w with y🡪w which we also remove via or due to transitivity leaving us with minimal cover of y 🡪 xz, x🡪w

1. Projection of F on R1:

{y🡪z, y🡪w}

1. Projection of F on R2:

y🡪x

1. No, decomposition D does not preserve the functional dependencies of F because the union of R1 and R2 does not cover all functional dependencies since x🡪w will remain uncovered.

B-2 LOSSLESS DECOMPOSITION

1. Da is not lossless since there is no union between R1 and R2(null)
2. Db is not lossless since there is a union on A4 but not all covered hence not lossless
3. Dc is not lossless despite union on A5 due to inability to deduce A3 from A5
4. Dd is lossless since all dependencies are covered in this scenario