Lab 2 Functional dependencies and Normal forms

1. Consider the relation scheme with attributes S (store), D (department), I (item), and M (manager), with functional dependencies SI → D and SD → M.

a) Find all keys for SDIM.

- key is SI

b) Show that SDIM is in second normal form but not third normal form.

- SDIM not depend on 3NF, but depend on 2NF, because of SD→M violation 3NF, 011

2. Consider the relation scheme with attributes CITY, ST, and ZIP, which we here abbreviate C, S, and Z. We observed the dependencies CS → Z and Z → C. The decomposition of the relation scheme CSZ into SZ and CZ has a lossless join. Does this decomposition preserve dependencies?

F = {CS → Z, Z → C}

R1 = {SZ}, F1 = Ø

R2 = {CZ}, F2 = {Z → C}

The reference of F on SZ and CZ has only Z → C and no CS → Z. Therefore, the separation function does not preserve dependency.

3. Let F = {AB →C, A → D, BD → C}.

a) Find a minimal cover for F.

+) Depends on the minimum function of F = {A→ D, BD→ C} because A→D and BD→C should be AB→C redundant.

b) Give a 3NF, dependency-preserving decomposition of ABCD into only two schemes (with respect to the set of functional dependencies F).

+) we split into functional dependencies:

- R1 (AD), F1 = {A→ D} and

- R2 (BCD), F2 = {BD→ C}

c) What are the projected dependencies for each of your schemes?

+ Reference of F to F1 is: A→ D

+ The reference for F on F2 is: BD→ C.

d) Does your answer to (a) have a lossless join? If not, how could you modify the database scheme to have a lossless join and still preserve dependencies?

+ keys of F are: AB and no properties of F1 and F2 are super keys.

→ T add dependencies R3 (AB) => R (AD, BCD, AB).

4. Let F = {AB →C, A →B}.

a) Find a minimal cover for F.

+) Minimum function dependency of F = {A→BC} because A→B so AB→C is extra attribute B.

b) When (a) was given on an exam at a large western university, more than half the

class answered G = {A →B, B →C}. Show that answer is wrong by giving a relation that satisfies F but violates G.

+) dependency of G function is wrong because in dependency of F function, we can not determine B→C dependency, but in G there is B→C dependence, this is a violation.

5. Suppose we are given relation scheme ABCD with functional dependencies {A→ B, B → C, A → D, D → C}. Let p be the decomposition (AB, AC, BD).

a) Find the projected dependencies for each of the relation schemes of p.

+) the reference of F on dependency (AB) is: A→B

+) the reference for F on dependencies (AC) is: A→C

+) the reference for F on dependencies (BD) is: Ø

b) Does p preserve the given dependencies?

Because we cannot deduce B→C and D→C from the reference of F on decomposition dependencies, there is no functional dependency guaranteed.

6. Consider the relation scheme ABCD with dependencies F={A → B , B →C, D→ B} We wish to find a lossless-join decomposition into BCNF.

a) Suppose we choose, as our first step, to decompose ABCD into ACD and BD. What are the projected dependencies in these two schemes?

R1{B, D} F1{ D→ B}

R2{A,C,D} F2{AD→ C}

b) Are these schemes in BNCF? If not, what further decomposition is necessary?

These schemes in BNCF because {D} is the super key of R1 and {AD} are the super key of R2