Homework 3 zl9901

1)

a) A -> B A can determine B
C -> A C can determine A
C -> B C can determine B
AC -> B Since it is entailed by C -> B, we should drop this
BC -> A Since it is entailed by C -> A, we should also drop this

b) According to the relation above, the only candidate key should be **C**.

2)

a) Since **{Car#, Salesman#}** is the candidate key,
according to Car# -> Date_sold, this is a partial dependency, this relation is in 1st normal form.

b) For the relationship: Date_sold -> Discount_amt
Both the determinant and dependent are non-key attribute, it is a transitive dependency, we should split it into two tables.
R1(Date_Sold, Discount_amt) and R2(Car#, Date_sold, Salesman#, Commission%)
R1∩R2={Date_sold} -> R1, there are no losses.
For table R1, candidate key is **{Date_sold},** this table is in BCNF already.
For table R2, the relationship: Car# -> Date_sold, it is a partial dependency, we should split it into two tables.

R21(Car#, Date_sold) and R22(Car#, Salesman#, Commission%)
R21∩R22={Car#} -> R3, there are no losses.
For table R21, candidate key is **{Car#},** this table is in BCNF already.
For table R22, the relationship: Salesman# -> Commission%, it is a partial dependency, we should split it into two tables.

R221(Salesman#, Commission%) and R222(Car#, Salesman#)
R221∩R222={Salesman#} -> R221, there are no losses.
For table R221, candidate key is **{Salesman#}**, this table is in BCNF already..
For table R222, candidate key is **{Car#, Salesman#}**, this table is in BCNF already.
So the final result should be:
R1(Date_Sold, Discount_amt)R21(Car#, Date_sold)R221(Salesman#, Commission%)
R222(Car#, Salesman#)

3)

a) The candidate key of R should be **{A, B, D}**

b) For the relation: AB -> C, it is a partial dependency, so it is not in 2NF.

c) For the relationship: AB -> C, it is a partial dependency, we should split it into two tables.

R1(A, B, C, I) and R2(A, B, D, E, F, G, H, J)

R1 ∩ R2={A, B} -> R1, there are no losses.

For table R1, the candidate key is **{A, B}**, the relation: A -> I is a partial dependency, we should split it into two tables.

R11(A, I) and R12(A, B, C)

R11 ∩ R12={A} -> R11, there are no losses.

For table R11, the candidate key is **{A}**, this table is in BCNF already.

For table R12, the candidate key is **{A, B}**, this table is in BCNF already.

For table R2, the candidate key is **{A, B, D}**, the relation: BD -> EF is a partial dependency, we should split it into two tables.

R21(B, D, E, F) and R22(A, B, D, G, H, J)

R21 ∩ R22={B, D} -> R21, there are no losses.

For table R21, the candidate key is **{B, D}**, this table is in BCNF already.

For table R22, the candidate key is **{A, B, D}**, the relation: AD -> GH is a partial dependency, we should split it into two tables.

R221(A, D, G, H, J) and R222(A, B, D)

R221 ∩ R222={A, D} -> R221, there are no losses.

For table R221, the candidate key is **{A, D}**, the relation H -> J is a transitive dependency, we should split it into two tables.

R2211(H, J) and R2212(A, D, G, H)

R2211 ∩ R2212={H} -> R2211, there are no losses.

For table R2211, the candidate key is **{H}**, this table is in BCNF already.

For table R2212, the candidate key is **{A, D}**, this table is in BCNF already.

For table R222, the candidate key is **{A, B, D}**, this table is in BCNF already.

So the final result should be:

R11(A, I) R12(A, B, C) R21(B, D, E, F) R2211(H, J) R2212(A, D, G, H) R222(A, B, D)

4)

a) The candidate key of R should be **{Book_title, Author_name}**
For the relation: Book_title -> Publisher, Book_type, it is a partial dependency, so it is in 1st normal form

b) For the relationship: Book_title -> Publisher, Book_type, it is a partial dependency, we should split it into two tables.
R1(Book_title, Publisher, Book_type, List_price) and
R2(Book_title, Author_name, Author_affil)
R1 ∩ R2={Book_title} -> R1, there are no losses.
For table R1, the candidate key is **{Book_title}**, the relation: Book_type -> List_price is a transitive dependency, we should split it into two tables.

R11(Book_type, List_price) and R12(Book_title, Publisher, Book_type)
R11 ∩ R12={Book_type} -> R11, there are no losses.
For table R11, the candidate key is **{Book_type}**, this table is in BCNF already.
For table R12, the candidate key is **{Book_title}**, this table is in BCNF already.

For table R2, the candidate key is **{Book_title, Author_name}**, the relation:
Author_name -> Author_affil is a partial dependency, we should split it into two tables.
R21(Author_name, Author_affil) and R22(Book_title, Author_name)
R21 ∩ R22={Author_name} -> R21, there are no losses.
For table R21, the candidate key is **{Author_name}**, this table is in BCNF already.
For table R22, the candidate key is **{Book_title, Author_name}**, it is in BCNF already:

So the final result should be:
R11(Book_type, List_price)
R12(Book_title, Publisher, Book_type)
R21(Author_name, Author_affil)
R22(Book_title, Author_name)