**Mason Shepherd**

**Homework 4: due February 12th 11:59PM.**

**14.20** - What update anomalies occur in the EMP\_PROJ and EMP\_DEPT relations of Figure 15.3 and 15.4? (Assuming 14.3 and 14.4?)

Ans:

All 3 anomalies – insertion, deletion and modification – occur.

**14.29** - Consider the following relations for an order-processing application database at ABC, Inc.

ORDER (O#, Odate, Cust#, Total\_amount)

ORDER-ITEM (O#, I#, Qty\_ordered, Total\_price, Discount%)

Assume that each item has a different discount. The Total\_price refers to one item, Odate is the date on which the order was placed, and the Total\_amount is the amount of the order. If we apply a natural join on the relations Order-Item and Order in this database, what does the resulting relation schema look like? What will be its key? Show the FDs in this resulting relation. Is it in 2NF? Is it in 3NF? Why or why not? (State any assumptions you make.)

Ans:

**NEW\_NAME**(O#, I#, Qty\_ordered, Total\_price, Discount%, Odate, Cust#, Total\_amount)

*Key*: (underlined) O# and I#

*FDs*: FD1: O#, I# → Qty\_ordered

FD2: I# → Total\_price, Discount%

FD3: O# → Odate, Cust#, Total\_amount

*2NF?*: No. I# and O# by themselves are not primary or secondary keys. FD2 and FD3 show that there are non-key attributes dependent on other non-keys.

*3NF?*: No. Though there are no transitive dependencies, the conditions for 2NF are not satisfied.

**14.30** - Consider the following relation:

CAR\_SALE(Car#, Date\_sold, Salesman#, Commission%, Discount\_amt)

Assume that a car may be sold by multiple salesmen and hence {CAR#, SALESMAN#} is the primary key. Additional dependencies are:

Date\_sold ->Discount\_amt and

Salesman# ->commission%

Based on the given primary key, is this relation in 1NF, 2NF, or 3NF? Why or why not? How would you successively normalize it completely?

Ans:

*1NF*(?): Yes. Thanks to the use of both of the attributes, Car# AND Salesman#, as a primary key, no tuple contains multiple values.

*2NF*(?): No. A non-key attribute is dependent on a subset of a superkey. (Salesman# → Commission%)

*3NF*(?): No. Because *Date\_sold* → *Discount\_amt*, *Car#, Salesman#* → *Discount\_amt* is a transitive dependency.

*For 2NF*: Decompose CAR\_SALE into

CAR\_SALE1(Car#, Salesman#, Date\_sold, Discount\_amt) and

SALESMAN\_COM(Salesman#, Commission%)

*For 3NF*: Decompose CAR\_SALE1 into

CAR\_SALE\_A(Car#, Salesman#, Date\_sold) and

DISCOUNT(Date\_sold, Discount\_amt)

…so we should have: CAR\_SALE\_A(Car#, Salesman#, Date\_sold),

DISCOUNT(Date\_sold, Discount\_amt) and

SALESMAN\_COM(Salesman#, Commission%)