**Database Design - Quiz 4**

**1.** Consider the following relation:

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

Assume that a car may be sold by multiple salespeople, and hence {Car#, Salesperson#} is the primary key. Additional dependencies are

Date\_sold → Discount\_amt and

Salesperson# → 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?

**2.** Consider the following relation for published books:

BOOK (Book\_title, Author\_name, Book\_type, List\_price, Author\_affil, Publisher)

Author\_affil refers to the affiliation of author. Suppose the following dependencies exist:

Book\_title → Publisher, Book\_type

Book\_type → List\_price

Author\_name → Author\_affil

a. What normal form is the relation in? Explain your answer.

b. Apply normalization until you cannot decompose the relations further.

**3.** Consider the relation REFRIG(Model#, Year, Price, Manuf\_plant, Color),which is abbreviated as REFRIG(M, Y, P, M\_P, C), and the following set F of functional dependencies: F = {M → M\_P, {M, Y} → P, M\_P → C}

a. Evaluate each of the following as a candidate key for REFRIG, giving reasons why it can or cannot be a key: {M}, {M, Y}, {M, C}.

b. Based on the above key determination, state whether the relation REFRIG is in 3NF and in BCNF. Explain why. If relation is not already in 3NF, normalize it into 3NF.

**4.** Are F and G equivalent?

F = {A->C, AC->D, E->AD, E->H}

G = {A->CD, E->AH}

**5.** Consider the relation schemaS (P, C, R, A) and below functional dependencies. Normalize S into 3NF by using minimal cover method.

P -> R, C, A

R, C -> A, P

A->C