

# CSC4341 Database Management Systems

## Functional Dependence and Normalization

1. Work on 11.11 on p345. Use the inference rules (Armstrong's axioms) to prove that the two sets of FDs are equivalent (that is, the one set of FDs can be derived from the other)
2. Consider the following relation with attributes of A, B, and C.

Tuple	A	B	C
1	A1	B1	C1
2	A1	B2	C2
3	A2	B1	C4
4	A3	B4	C3
5	A4	B1	C1
6	A5	B4	C3

Given the content of the relation above, which of the following functional dependencies may hold in the above relation? If the dependencies cannot hold, explain why by specifying the tuples that cause the violation.

- A.  $A \rightarrow B$
  - B.  $B \rightarrow C$
  - C.  $C \rightarrow B$
  - D.  $C \rightarrow A$
3. **Normalization:** Consider a relation called CAR\_SALE that is used to keep track of car sales by each salesman in a car dealer. The attributes of the relation CAR\_SALE are:  
CAR#,  
SALESMAN#,  
DATE\_SOLD, COMMISSION%,

DISCOUNT\_AMOUNT.

The meaning of the attributes is self-explanatory. Assume that a car may be sold by multiple salesmen and the primary key of the relation is {CAR#, SALESMAN#}. Additional functional dependencies are: DATE\_SOLD  $\rightarrow$  DISCOUNT\_AMOUNT, SALESMAN#  $\rightarrow$  COMMISSION%

Based on the given primary key and functional dependencies, is this relation is 1NF, 2NF, or 3NF? Why? If not, how would you successively normalize it completely?