CS 336 – EXTRA CREDIT HOMEWORK

Problem 1 Suppose that we have the following four tuples in a relation S with three attributes ABC: (1,2,3), (4,2,3), (5,3,3), (5,3,4). Which of the following functional ($\rightarrow$) and multivalued ($\rightarrow\!\!\!\rightarrow$) dependencies can you infer does *not* hold over relation S?

1. $A \rightarrow B$
2. $A \rightarrow\!\!\!\rightarrow B$
3. $BC \rightarrow A$
4. $BC \rightarrow\!\!\!\rightarrow A$
5. $B \rightarrow C$
6. $B \rightarrow\!\!\!\rightarrow C$

Problem 2 Consider a relation R with five attributes $ABCDE$.

1. For each of the following instances of R, state whether it violates (a) the FD $BC \rightarrow D$ and (b) the MVD $BC \rightarrow\!\!\!\rightarrow D$:
   (a) { } (i.e., empty relation)
   (b) {(a,2,3,4,5), (2,a,3,5,5)}
   (c) {(a,2,3,4,5), (2,a,3,5,5), (a,2,3,4,6)}
   (d) {(a,2,3,4,5), (2,a,3,4,5), (a,2,3,6,5)}
   (e) {(a,2,3,4,5), (2,a,3,7,5), (a,2,3,4,6)}
   (f) {(a,2,3,4,5), (2,a,3,4,5), (a,2,3,6,5), (a,2,3,6,6)}
   (g) {(a,2,3,4,5), (a,2,3,6,5), (a,2,3,6,6), (a,2,3,4,6)}
2. If each instance for R listed above is legal, what can you say about the FD $A \rightarrow B$?

Problem 3 Consider the following actions taken by transaction $T1$ on database objects X and Y:

R(X), W(X), R(Y), W(Y)

1. Give an example of another transaction $T2$ that, if run concurrently to transaction T without some form of concurrency control, could interfere with $T1$.
2. Explain how the use of *Repeatable Read* Isolation Level would prevent interference between the two transactions.

Problem 4 Consider a database with objects X and Y and assume that there are two transactions $T1$ and $T2$. Transaction $T1$ reads objects X and Y and then writes object X. Transaction $T2$ reads objects X and Y and then writes objects X and Y.

1. Give an example schedule with actions of transactions $T1$ and $T2$ on objects X and Y that results in a write-read conflict.
2. Give an example schedule with actions of transactions $T1$ and $T2$ on objects X and Y that results in a read-write conflict.
3. Give an example schedule with actions of transactions $T1$ and $T2$ on objects X and Y that results in a write-write conflict.
4. For each of the three schedules show that the use of *Repeatable Read* Isolation Level disallows the schedule.