Thi Nguyen, CS450 - Homework 7 Wednesday, July 27, 2016

Problem1:

1. The relation instance does not satisfy the functional dependency AB->C because when A = B =1, there are two different values of C (2 and 3)
2. All functional dependencies that are satisfied by the given relation instance:

ABC->ABC, ABC->AB, ABC->AC, ABC->BC, ABC->A, ABC->B, ABC->C
AB->ABC, AB->AB, AB->AC, AB->BC, AB->A, AB->B, AB->C
AC->AC, AC->A, AC->C
BC-> ABC, BC->AB, BC->AC, BC->BC, BC->A, BC->B, BC->C
A->A
B->ABC, B->AB, B->AC, B->BC, B->A, B->B, B->C
C->AC, C->A, C->C

Problem2:

1. A->B Given
2. B->C Given
3. A->C Transitivity of 1 and 2
4. AB->CB Augmentation of 3 with B

Problem3:

1. X->YZ given
2. YZ->Y Flexivity $Y \subseteq YZ$
3. YZ->Z Flexivity $Z \subseteq YZ$
4. X->Y Transivity of 1 and 2
5. X->Z Transivity of 1 and 3

Problem4:

Let X = A, Y=B, Z=C. Consider the following table:

A	B	C
1	2	1
1	2	2
2	3	3

According to the above table, A->B and C->B are satisfied but A->C is not.

Problem5:

1. The set of all functional dependencies that are entailed by F:

Functional dependencies that are trivial:
ABC->ABC, ABC->AB, ABC->AC, ABC->BC, ABC->A, ABC->B, ABC->C
AB->AB, AB->A, AB->B, AC->AC, AC->A, AC->C, BC->BC, BC->B,BC->C
A->A, B->B, C->C
Functional dependencies that are non-trivial:

AB->ABC, AC->ABC, AC->AB, AC->BC, AC->A, AB->AB, AB->B

2. Superkeys are: ABC, AC, BC
   Candidate keys are: AC, BC

Problem6:

1. A is the superkey of ABC and ADE => (A,B,C) and (A,D,E) is a lossless-join decomposition of R
2. C is neither the superkey of ABC or CDE => (A,B,C) and (C,D,E) is not a lossless join decomposition of R
3. (B,D) and (A,B,C,E)

Problem7:

1. key of V is: (Date,P#)
2. V is not BCNF because there are three functional dependencies whose left-hand-side are not superkey:
   P#->Pname, E#->Ename, Diagnosis->Cost
3. V1=(Date, P#, Pname) is not BCNF because the functional dependency P#->Pname whose left-hand-side is not a superkey
4. V2=(Date, E#, Ename, Diagnosis, Cost) is not BCNF because its functional dependencies (Diagnosis->Cost), (E#->Ename) whose left-hand-sides are not superkey
5. V1 and V2 is not a lossless-join decomposition because its common attribute (Date) neither the superkey of V1 nor V2
6. (Diagnosis, Cost), (E#,Ename), (P#,Pname), (Date,P#, E#,Diagonis)

Problem8:

1. PatId->PatName,
   SurgId->SurgName
   (SurgId, AppDate) -> SurgLoc
   (AppDate, SurgLoc) -> SurgId
   (PatId, AppDate, AppTime) -> SurgLoc
   (SurgLoc, AppDate, AppTime) -> PatId
   (SurgId, AppDate, AppTime) -> PatId
   (PatId, AppDate, AppTime) -> SurgId

2. Negative aspects of the initial relation:
   - Waste of space when PatId is repeated unnecessarily in the (PatId, AppDate, AppTime) -> SurgLoc and (PatId, AppDate, AppTime) -> SurgId
   - Multiple updates to if AppTime or AppDate changes

   Waste of space when SurgId is repeated unnecessarily in the (SurgId, AppDate) -> SurgLoc and (SurgId, AppDate, AppTime) -> PatId

3.

(PatId, PatName), (SurgId, SurgName), (SurgId, AppDate, SurgLoc), (PatId, SurgId, AppDate, AppTime)