CS630 HW6

Q1

Here we are given a Relation R with four attributes ABCD and the following set of FDs:

$$F = \{B \rightarrow C, D \rightarrow A\}$$

We need first identify the keys for R and then need to determine if R is in BCNF, 3NF or none of them.

X	X+
A	A
B	B,C
C	C
D	D,A
AB	A,B,C
AC	A,C
AD	A,D
BC	B,C
BD	B,D,C,A
CD	C,D,A
ABC	A,B,C
ABD	
ACD	A,C,D
BCD	

K = BD

F+ = {B→C, D→A, AB→C, BD→C, BD→A, CD→A}

 S h r e y a n s h   D h a n d h u k i a

FD	Is BCNF Violation?	Is 3NF Violation?
B→C	Yes	Yes
D→A	Yes	Yes
AB→C	Yes	Yes
BD→C	No	No
BD→A	No	No
CD→A	Yes	Yes

The Relation R is not BCNF and also not 3NF

Now since it is not BCNF we have to decompose.

Case 1: B→C

ABCD

F+= {B→C, D→A, AB→C, BD→C, BD→A, CD→A}

B→C

BC   Fx+= {B→C}   ABD   Fy+= {D→A, BD→A}

BCNF

D→A

DA   BD

Fz+= {D→A}
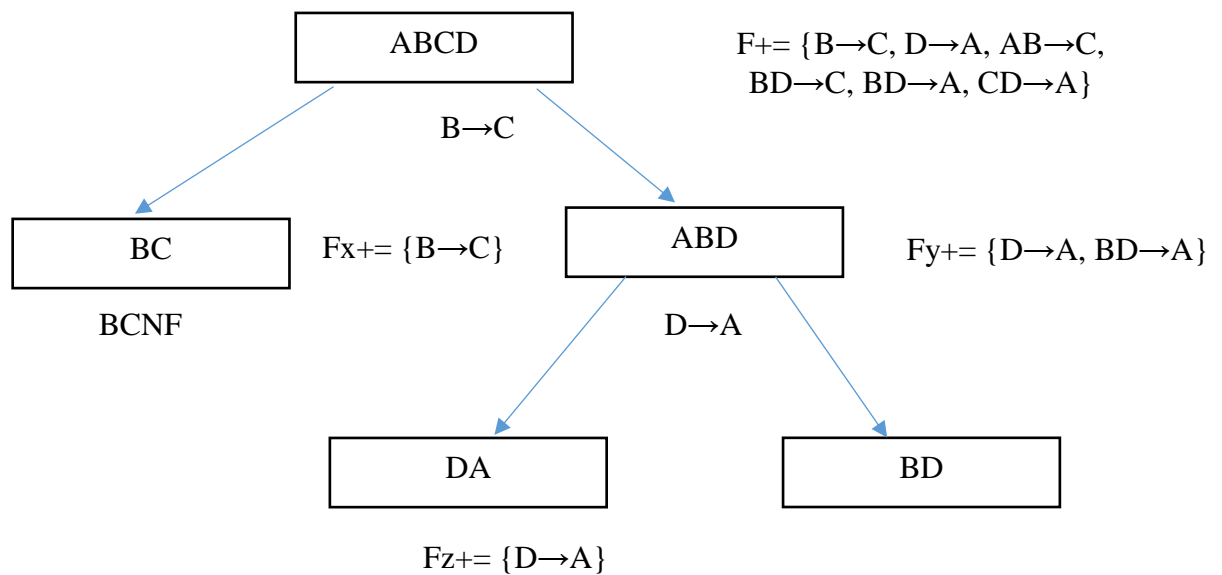
X	X+
A	A
B	B
D	D,A
AB	A,B
AD	A,D
BD	A,B,D

New K= BD

F+ = {D→A, BD→A}

FD	Is BCNF Violation?
D→A	Yes
BD→A	No

Decomposition: BC, DA, BD

Q2

Here we are given a Relation R with four attributes ABCD and the following set of FDs:

$$F = \{AB{\rightarrow}C, B{\rightarrow}D\}$$

We need first identify the keys for R and then need to determine if R is in BCNF, 3NF or none of them.

X	X+
A	A
B	B,D
C	C
D	D
AB	A,B,C,D
AC	A,C
AD	A,D
BC	B,C,D
BD	B,D
CD	C,D
ABC	
ABD	
ACD	A,C,D
BCD	B,C,D

K = AB

F+ = {AB→C, B→D, AB→D, BC→D}

FD	Is BCNF Violation?	Is 3NF Violation?
AB→C	No	No
B→D	Yes	Yes
AB→D	No	No
BC→D	Yes	Yes

So it is not BCNF and also not 3NF.

Now since it is not BCNF we have to decompose.

Case 1: B→D

ABCD   F+={AB→C, B→D, AB→D, BC→D}

B→D

BD   Fx+= {B→D}   ABC   Fy+={AB→C}
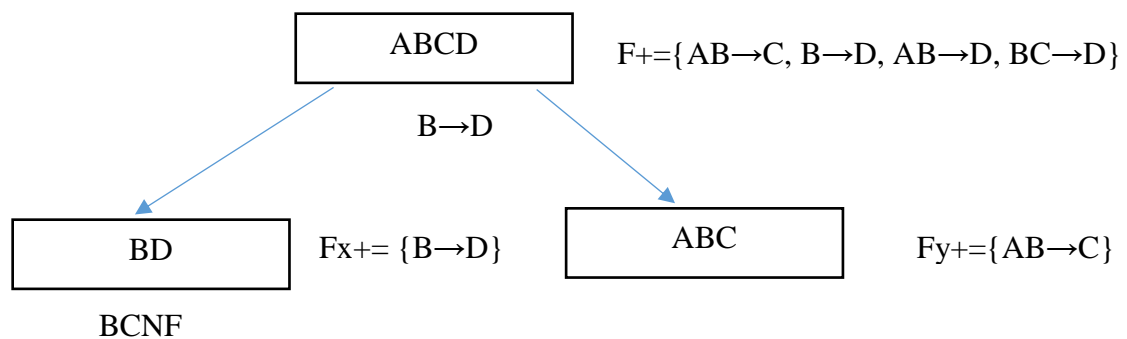
BCNF

X	X+
A	A
B	B
C	C
AB	A,B,C
AC	A,C
BC	B,C

K = AB

F+ = {AB→C}

FD	Is BCNF Violation?
AB→C	No

Decomposition: BD, ABC

Q3

Step 1:

Sys
↓ P, Y
A → P, Y → B

D   E   C

Step 2:

Sys
↓ P, Y
A → P, Y → B
  ↘ P, Y
D   E   C
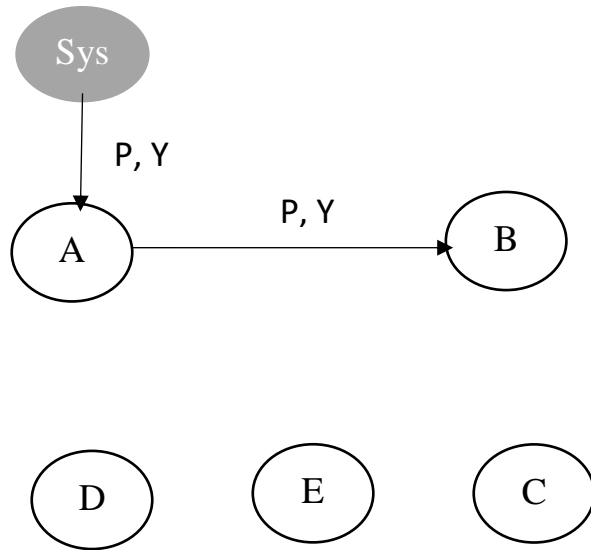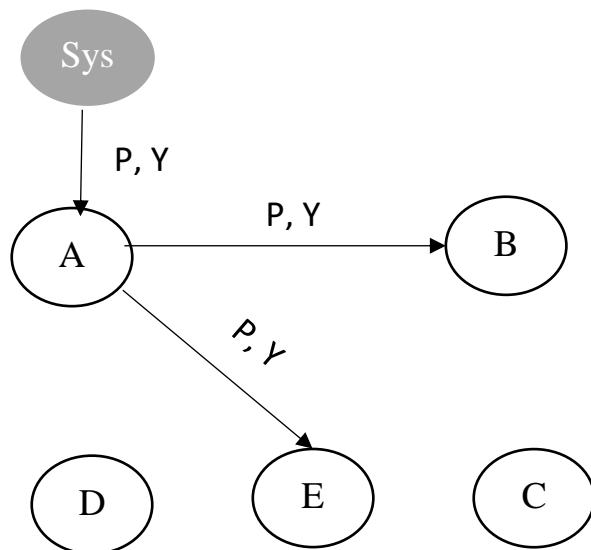
Step 3:
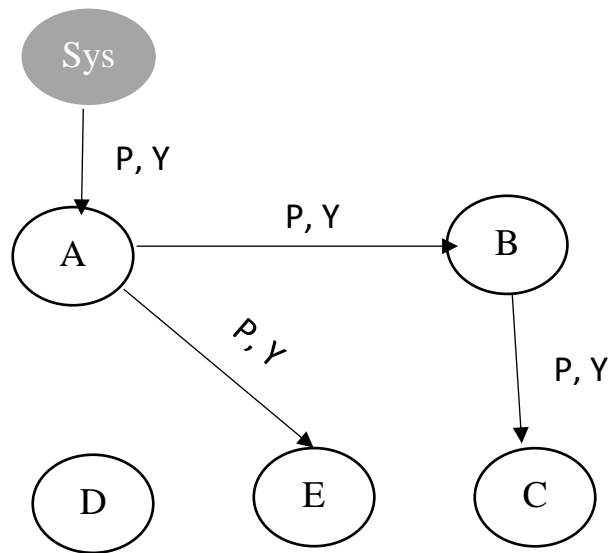
Step 4:

Step 5:

Step 6:

S h r e y a n s h   D h a n d h u k i a
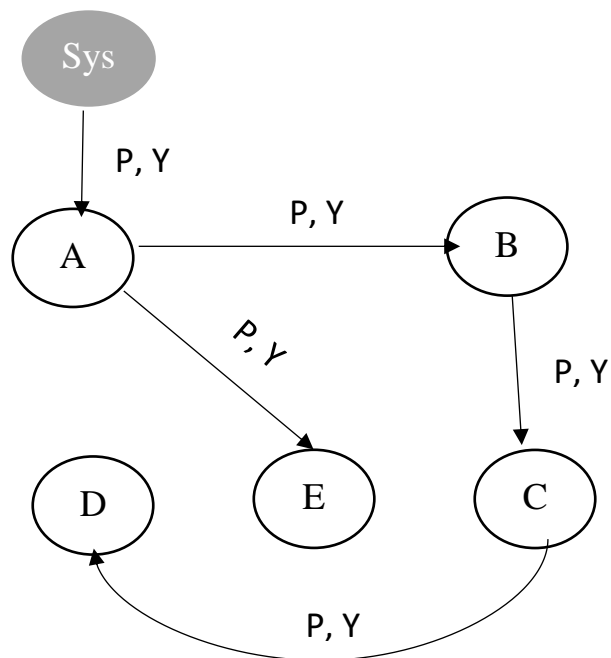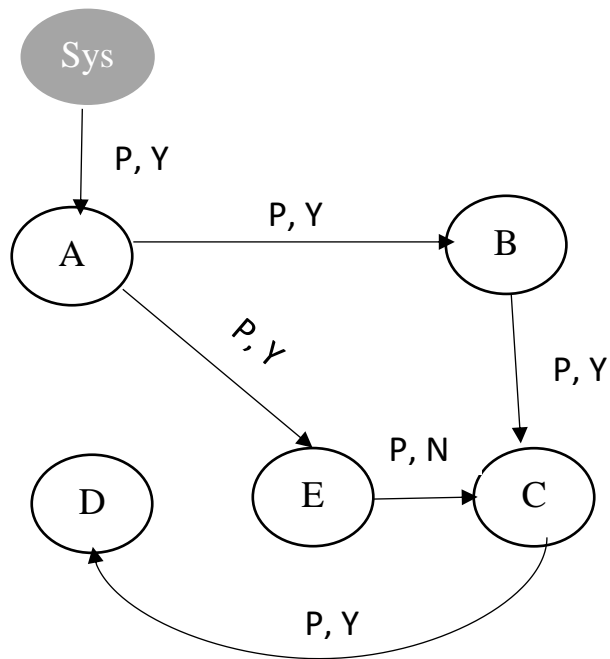
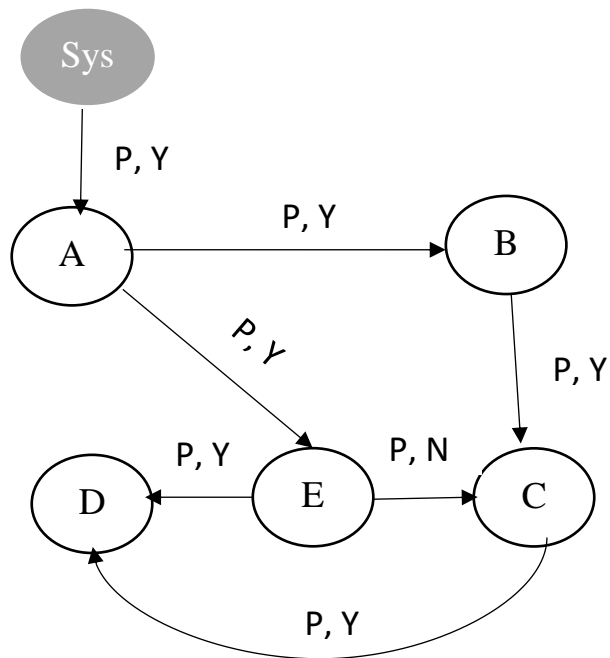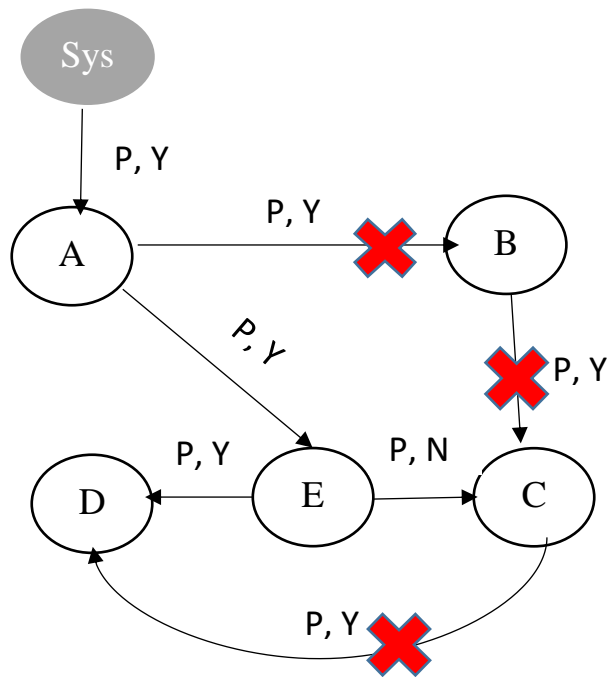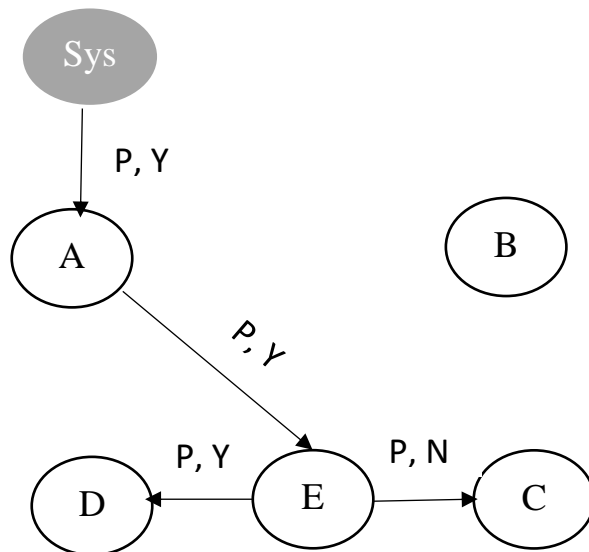**Step 7:**

So the new authorization will be

Yes D can still exercise the privilege as there is a path to D from A through E and E is granting that privilege to D. No B cannot exercise any privilege as none of the other nodes grant any permission to B.