

Question 1: Part A

x	x ⁺	Key?
A	A	
B	B,C	
C	C	
D	A,D	
AB	A,B,C	
AC	A,C	
A,D	A,D	
BC	B,C	
BD	A,B,C,D	Yes, Minimal Key
CD	A,C,D	
ABC	A,B,C	
ABD	A,B,C,D	Super Key
ACD	A,C,D	
BCD	A,B,C,D	Super Key

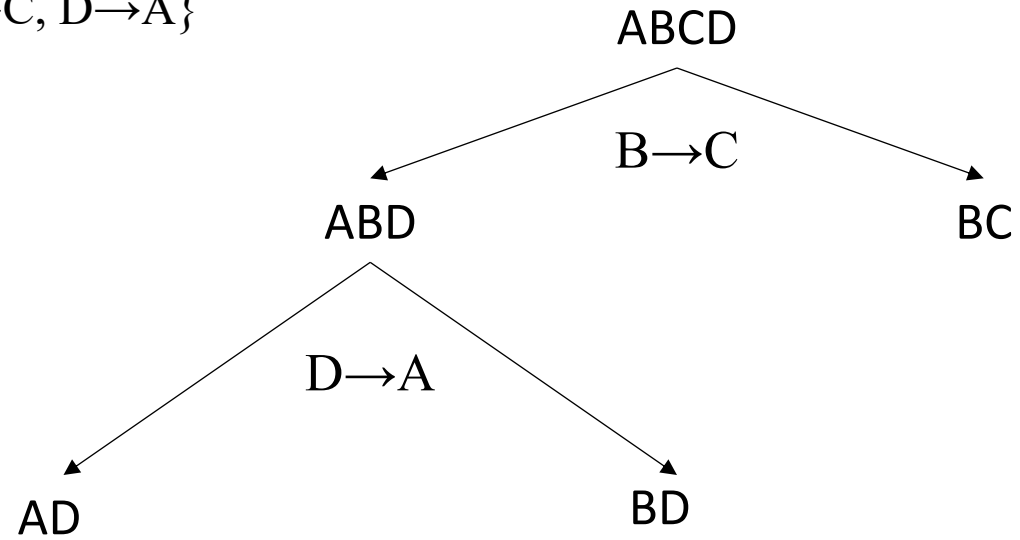
Question 1: Part B

R is not in BCNF because both FD's are violations.

It is **NOT** in 3NF because A,C does not belong to a key.

Question 1: Part C

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



Question 2: Part A

x	x⁺	Key?
A	A	
B	B,D	
C	C	
D	D	
AB	A,B,C,D	Yes, Minimal Key
AC	A,C	
A,D	A,D	
BC	B,C,D	
BD	B,D	
CD	C,D	
ABC	A,B,C,D	Super Key
ABD	A,B,C,D	Super Key
ACD	A,C,D	
BCD	B,C,D	

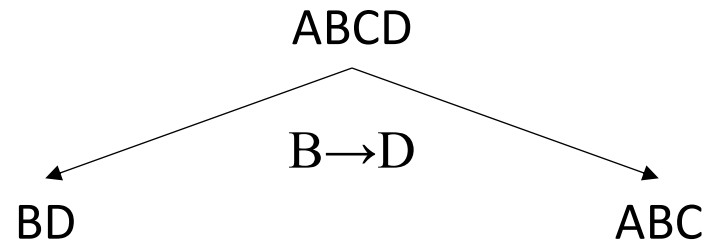
Question 2: Part B

R is not in BCNF because at least 1 FD violates BCNF.

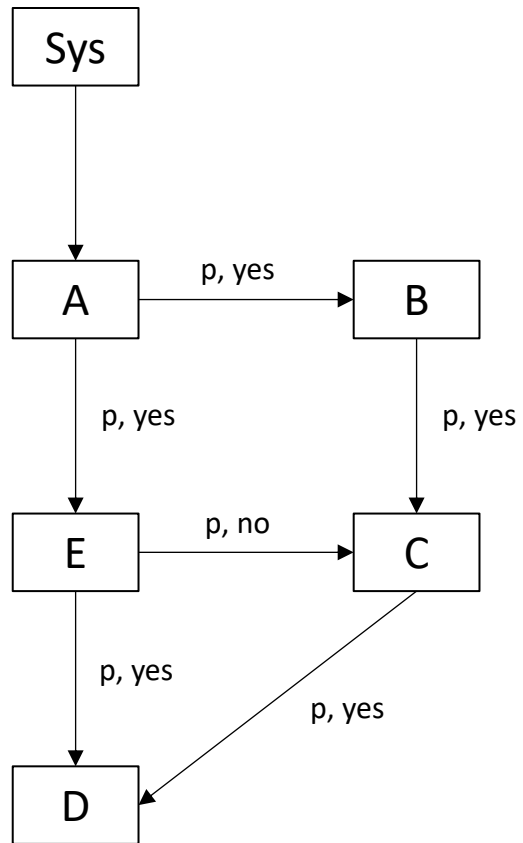
R is not 3NF because D is not part of any key.

Question 2: Part C

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



Question 3: Part A – After Step 6



Question 3: Part B – After Step 7

