Section 3 Solutions

Exercise 3.1.2

ID -> Px, Py, Pz, Vx, Vy,Vz

Pz,Py,Pz -> ID

Exercise 3.1.3

a) 2^{n-1}

b)$2^{n-1} + 2^{n-1} – 2^{n-2}$

c) $2^{n-2} + 2^{n-2} – 2^{n-4}$

d) $2^{n-2} + 2^{n-2} – 2^{n-3}$

Exercise 3.2.1

a) C -> A, C -> D, D->A, AB->C, AB->D, AC->D, BC->A, BC->D, BD->A, BD->C, CD->A, ABC->D, ABD->C, BCD->A

b) AB, BC, BD

c) AB, BC, BD, ABC, ABD, BCD, ABCD

Exercise 3.2.2 i

a) A->B, A->C, A->D, B->C, B->D, AB->C, AB->D, AC->B,AC->D, AD->B, AD->C, BC->D,BD->C, ABC->D, ABD->C,ACD->B

b)A

c) A, AB, AC, AD, ABC, ABD, ACD,ABCD

Exercise 3.2.2 ii

a) AB->C, AB->D,AD->B, AD->C, BC->A, BC->D, CD->A, CD->B, ABC->D, ABD->C, ACD->B, BCD->A

b) AB, BC, CD

c) AB, BC, CD, ABC, ABD, ACD,BCD ,ABCD

Exercise 3.2.2 iii

a) All possible non-trivial dependences with one attribute on the right side are functional dependencies in this relation.

b) A, B, C, D

c) All $2^4 - 1$ combinations of subsets of this relation are superkeys

Exercise 3.2.4

a)

A1	B1
A2	B1

b)

A1	B1	C1
A2	B1	C2

c)

A1	B1	C1
A2	B1	C2
A2	B2	C3

Exercise 3.2.10

a) C->A

b) AC->B

c) AC->B, BC->A

d) A->B, B->C, C->A

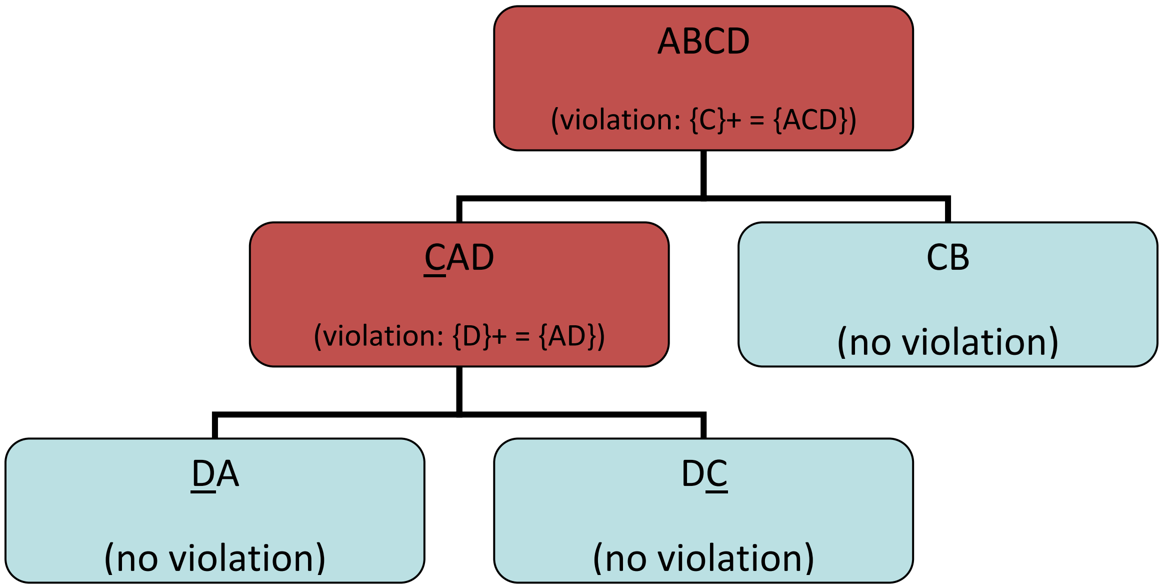
Exercise 3.3.1

Since there are many BCNF tables that can result from splitting on various violations, only the breakdowns from splitting on violations of one attribute on the left side are shown. Be aware that there can be situations where the only violations in table have more than attribute on the left and need to be split accordingly.

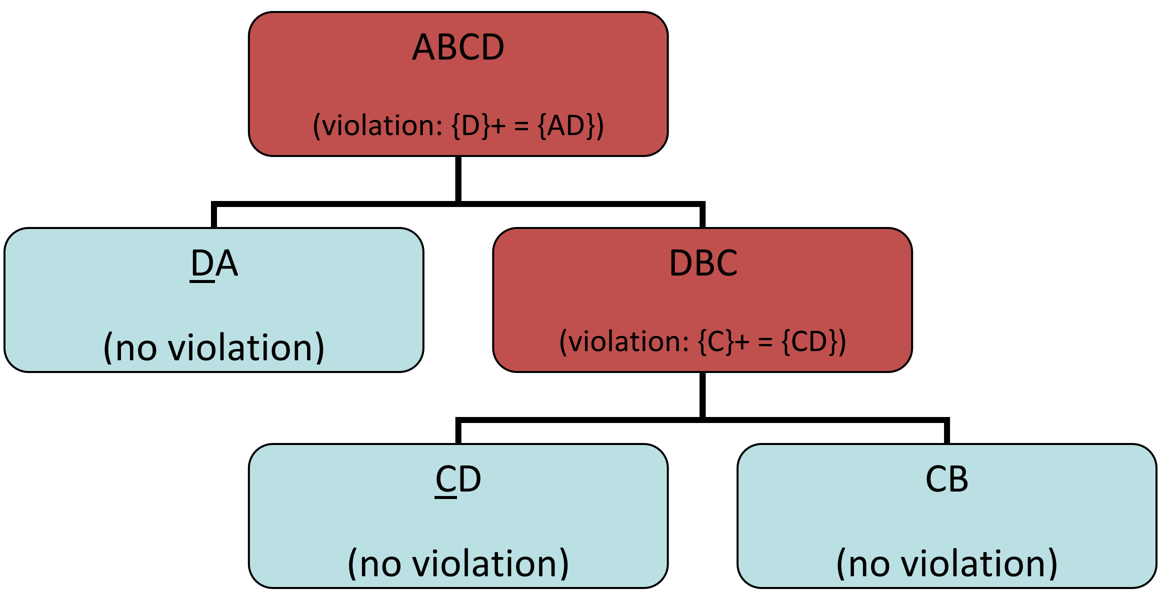
a)

i) {C}+ = {ACD}, {D}+ = {AD}, {AC}+ = {ACD}, {CD}+ = {ACD}

ii)



Resulting relations: (DA), (DC), (CB)

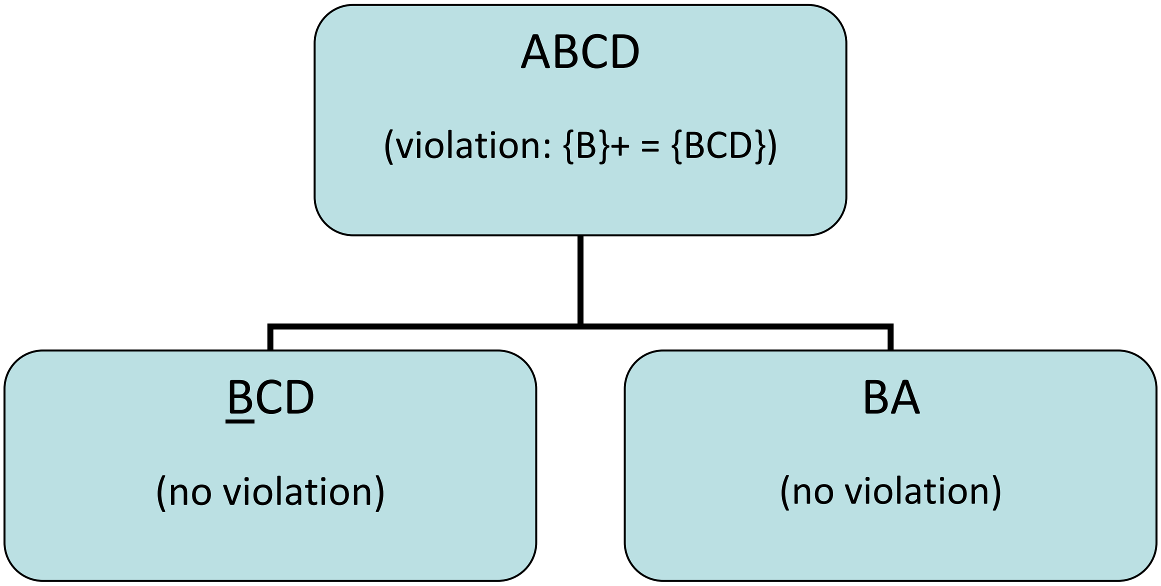


Resulting relations: (DA), (CD), (CB)

b)

i) {B}+ = {BCD}, {BC}+ = {BCD},{BD}+ = {BCD}

ii)



Resulting relations: (BCD, BA)

c) There are no violations

d) There are no violations

f) Due to length, this answer is not included. Send me an e-mail (joyleung at cs)if you would really like to see this solution as well.

Exercise Table

Note: Only non-trivial FD are listed

A->B

B->A

AC->BD

AD->BC

BC->AD

BD->AC

CD->AB

ABC ->D

ABD ->C

ACD ->B

BCD ->A