Assignment 3 - Emilia Bylund Månsson (emiby190) & Martin Forsberg (marfo203)

Task 1:

a) R(A, B, C, D, E, F)
FD1: A → BC
FD2: C → AD
FD3: DE → F

FD4: C → A (Decomposition of FD2)
FD5: C → BC (Transitivity of FD1 and FD4)
FD6: C → B (Decomposition of FD5)

b) R(A, B, C, D, E, F)
FD1: A → BC
FD2: C → AD
FD3: DE → F

FD4: AE → BCE (Augmentation of FD1)
FD5: BEC → BEAD (Augmentation of F2)
FD6: AE → BEAD (Transitivity of FD4 and FD5)
FD7: AE → DE (Decomposition of FD6)
FD8: AE → F (Transitivity of FD7)

Task 2:

a) X+ = {A, B, C, D}
b) X+ = {C, E, A, D, F, B, C}

Task 3:

a)
Try FD1: CK{A,B} which gives CDEF
Try FD2: CK{E} → doesn't exist
Try FD3: CK{AD} → AB → CDEF → AB and AD which is CK

b) FD2 & FD3 violates BCNF because LHS is not a superkey

c) Decompose:

R = (A, B, C, D, E, F)

FD2
R1 = (A, B, C, D, E), CK {A,B} and {A,D}, FD: AB → CDE
Here we still has FD3: D→B which violates BCNF
R2 = (E, F), Candidate key = E (FD2) now in BCNF

Decompose R1 further
FD3
R1X = (A, C, D, E), CK {A}, FD: A→ CDE

R1Y = (D, B), CK{D] FD: D → B

Now all the three decomposed relations, R2, R1X and R1Y are in BCNF.

Task 4:

a) FD3: C is not a super key which violates the BCNF rules.
b) Decompose into smaller relations
R1: (C, D) , CK {C} which is in BCNF
R2: (A, B, C, E) , CK {A, B, C} FD: {A, B, C} → {E} which is in BCNF