# Lab 3 TDD12

Stian Lockhart Pedersen, Stilo759
Felix Nyrfors, Felny523

**Task 1**

Consider the relation schema R (A, B, C, D, E, F) and the following three FDs:
FD1: {A} → {B, C}
FD2: {C} → {A, D}
FD3: {D, E} → {F}
Use the Armstrong rules to derive each of the following two FDs. In both cases, describe the derivation process step by step (i.e., which rule did you apply to which FDs).

a) {C} → {B}

FD4: {C} → {A} (Decomposition FD2)
FD5: {A} → {B} (Decomposition FD1)
FD6: {C} → {B} (Transitivity FD4, FD5)

b) {A,E} → {F}

FD7: {A} → {C} (Decomposition FD1)
FD8: {C} → {D} (Decomposition FD2)
FD9: {A} → {D} (Transitivity FD7,FD8)
FD10: {A,E} → {D,E} (Augmentation FD9)
FD11: {A,E} → {F} (Transitivity FD10,FD3)

**Task 2**

For the aforementioned relation schema with its functional dependencies, compute the attribute closure X+ for each of the following two sets of attributes.
FD1: {A} → {B, C}
FD2: {C} → {A, D}
FD3: {D, E} → {F}

a) X = {A}

X+ = {A, B, C, D}

b) X = {C, E}

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

**Task 3**

Consider the relation schema **R (A, B, C, D, E, F)** with the following FDs

FD1: {A, B} → {C, D, E, F}

FD2: {E} → {F}

FD3: {D} → {B}

**a) Determine the candidate key(s) for R.**

{A, B}, {A, D} are candidate keys.

**b) Note that R is not in BCNF. Which FD(s) violate the BCNF condition?**

FD2 and FD3 violate the BCNF condition.

**c) Decompose R into a set of BCNF relations and describe the process step by step (do not forget to determine the FDs and the candidate key(s) for all the relation schemas along the way).**

**R (A, B, C, D, E, F) Both FD2 and FD3 is violated.**

->

R1(E, F) FD2 not violated. CK: {E}

R2(A, B, C, D, E) FD3 still violated

->

R1(E, F) FD2 CK: {E}

R2a (B, D) FD3 not violated. CK: {D}

R2b (A, C, D, E) We can derive AD->CE (**FD4**) from FD1 and FD3 (transitivity and decomposition) giving us CK: {A, D}

Result:

R1(E, F) FD2 CK: {E}

R2a (B, D) FD3 CK: {D}

R2b (A, C, D, E) FD4 CK: {A, D}

**Task 4**

Consider the relation schema R (A, B, C, D, E) with the following FDs

FD1: {A, B, C} → {D, E}

FD2: {B, C, D} → {A, E}

FD3: {C} → {D}

**a) Show that R is not in BCNF.**

R is not in BCNF because the CK: {B, C} is not in FD3.

**b) Decompose R into a set of BCNF relations (describe the process step by step).**

R1(C, D), FD3, CK: {C}

We take the content of FD3 and create a new relation. The attributes of the RHS are taken away from the former relation and creates R2.

R2(A, B, C, E). CK: {B, C}, FD2, FD3 approved

Now both relations are in BCNF