Task 1, R(A,B,C,D,E,F)

FD1: {A} → {B,C}
FD2: {C} → {A,D}
FD3: {D,E} → {F}

a) {C} → {B}

{C} → {A,D} =>/Decomposition/=> {C} → {A} =>
=>/Transitivity/=> {C} → {B,C} =>/Decomposition/=> {C} → {B}

b) {A,E} → {F}

{A} → {B,C} =>/Decomposition/=> {A} → {C} =>
=>/Transitivity/=> {A} → {A,D} =>/Decomposition/=>
=> {A} → {D} =>/Pseudo-transitivity/ {A,E} → {F}
{E,D} → {F}

Task 2

a) X={A} ⇒ X⁺={A,B,C,D}

b) X={C,E} ⇒ X⁺={A,B,C,D,E}

Task 3, R(A,B,C,D,E)

FD1: {A,B} → {C,D,E,F}
FD2: {E} → {F}
FD3: {D} → {B}

a) A must be part of candidate key because it only exists in LHS and not RHS

C and F can't be part of candidate key because they only exist in RHS and not LHS

{AB
AD

b) FD2 and FD3

c) Decompose with FD2
R1(E,F) with FD2 CK(E)
R2(A,B,C,D,E) with FD1 and FD3 CK(AB)
Decompose with FD3
R2a(D,B) with FD3 CK(D)
R2b(A,C,D,E) with FD1 CK(A) => FD4: {A} → {C,D,E}

Task 4 , R(A,B,C,D,E)

FD1: {A,B,C} → {D,E}
FD2: {B,C,D} → {A,E}
FD3: {C} → {D}

a) BC must be candidate key
FD1 violates BCNF properties

b) Decompose with FD3
R1(C,D) with FD3 CL(C)
R2(A,B,C,E) with FD1 and FD2 CL(BC)
FD4: {B,C} → {A,E}

FD5: {A,B,C} → {E}