CSC 174 Fall 2018
Homework Assignment 4
Total: 100 points

1. Given R(C, D, E, F, G), and the following functional dependencies:
   F → E
   F → G
   C → D

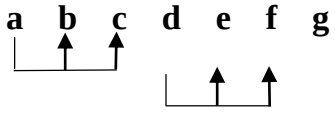
   We decompose R into two relations R1(C, D) and R2(E, F, G, C). Does this decomposition have the lossless join property? Show your steps to achieve the answer. (This one does not need to be typed.)

	C	**D**	**E**	**F**	**G**
R1	~~b11~~ a1	~~b12~~ a2	b13	b14	b15
R2	~~b21~~ a1	b22	~~b23~~ a3	~~b24~~ a4	~~b25~~ a5

	C	**D**	**E**	**F**	**G**
R1	a1	a2	b13	b14	b15
R2	a1	b22	a3	a4	a5

Result: There is no lossless join property. We know this because neither rows R1 nor R2 have a full row of a's. Having a full row of a's would resemble lossless join because all the columns in that row would be related through functional dependencies.

2. Given R(a,b,c,d,e,f,g) and the following functional dependencies:
   Fd1: a → {b,c}
   Fd2: d → {e,f}
   Decompose R into 3rd normal form with both dependency preservation property and loss-less join property.
   (This one must be typed)



Minimization:

1. $a \rightarrow b$ $d \rightarrow e$
   $a \rightarrow c$ $d \rightarrow f$

2. R1 (a, b, c) R2 (d, e, f)

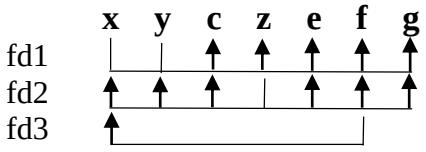
3. R3 (a, d, g)

Result: R1 (a, b, c) R2 (d, e, f) R3 (a, d, g)

3. Given R(x,y, c,z,e,f,g). There are two keys: (x,y) and z. Given the following functional dependency: F = { {x,y} → {c,z,e,f,g}, z → {x,y, c, e,f,g}, f→ x}. Decompose R into BCNF.
   (This one must be typed)

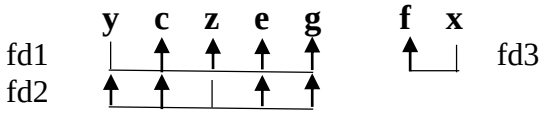
Minimization:

$\{x,y\} \rightarrow c$ $z \rightarrow x$ $f \rightarrow x$
$\{x,y\} \rightarrow z$ $z \rightarrow y$
$\{x,y\} \rightarrow e$ $z \rightarrow c$
$\{x,y\} \rightarrow f$ $z \rightarrow e$
$\{x,y\} \rightarrow g$ $z \rightarrow f$
$z \rightarrow g$



R (x, y, c, z, e, f, g)

D = {R1 (y, c, z, e, g) R2 (f, x)}



Result: R1 (y, c, z, e, g) R2 (f, x)