1. Design a counter that counts in the sequence: 101, 100, 011, 010, 001, 000, 101, ... Use clocked D flip-flops. Draw the circuit diagram. What will happen if your counter starts in an invalid state?

A B C	A+ B+ C+	Da Db Dc
000	101	101
001	000	000
010	001	001
011	010	010
100	011	011
101	100	100
110	XXX	XXX
111	XXX	XXX

Design Equations: $Da = AC + A'B'C'$, $Db = AC' + BC$, $Dc = C'$
If in state 110, NS is 011. If in state 111, NS is 110.

2. Repeat problem (1) using J-K flip-flops. You do not need to draw the circuit diagram.

A B C	A+ B+ C+	Ja Ka	Jb Kb	Jc Kc
000	101	1X	0X	1X
001	000	0X	0X	X1
010	001	0X	X1	1X
011	010	0X	X0	X1
100	011	X1	1X	1X
101	100	X0	0X	X1
110	XXX	XX	XX	XX
111	XXX	XX	XX	XX

Design Equations: $Ja = B'C'$, $Ka = C'$, $Jb = AC'$, $Kb = C'$, $Jc = 1$, $Kc = 1$
If in state 110, NS is 001. If in state 111, NS is 110.

3. Design a counter that counts in the sequence: 000, 010, 001, 100, 011, 110, 000, ... Use clocked T flip-flops. Design your counter to go to state 000 from all invalid states. There is no need to draw a circuit diagram.

A B C	A+ B+ C+	Ta Tb Tc
000	010	010
001	100	101
010	001	011
011	110	101
100	011	111
101	000	101
110	000	110
111	000	111

Design Equations: $Ta = A + C$, $Tb = C' + AB$, $Tc = C + A'B + AB'$