ECEn 220 HW 9 Pt 1

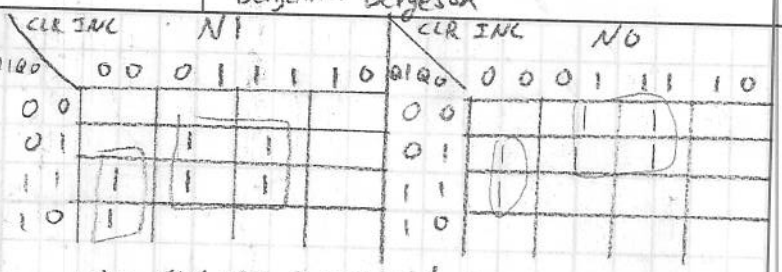
Benjamin Bergeson

14.1

(a)

CLR	INC	Q1	Q0	N1	N0
0	0	0	0	0	0
0	0	0	1	0	1
0	0	1	0	1	0
0	0	1	1	1	1
0	1	0	0	0	1
0	1	0	1	1	1
0	1	1	0	0	0
0	1	1	1	1	0
1	0	0	0	0	0
1	0	0	1	0	0
1	0	1	0	0	0
1	0	1	1	0	0
1	1	0	0	0	1
1	1	0	1	1	1
1	1	1	0	0	0
1	1	1	1	1	0

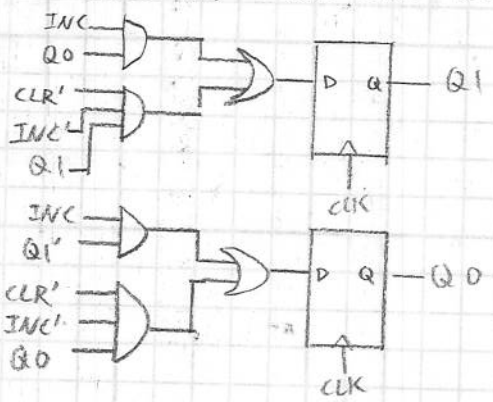
(b)



$N1 = INC \cdot Q0 + CLR' \cdot INC' \cdot Q1$

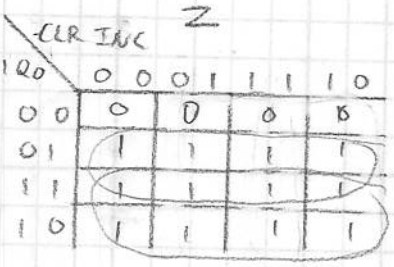
$N0 = INC \cdot Q1' + CLR' \cdot INC' \cdot Q0$

(c)



14.2 (a)

CLR	INC	Q1	Q0	N1	N0	Z
0	0	0	0	0	0	0
0	0	0	1	0	1	1
0	0	1	0	1	0	1
0	0	1	1	1	1	1
0	1	0	0	0	1	0
0	1	0	1	1	1	1
0	1	1	0	0	0	1
0	1	1	1	1	0	1
1	0	0	0	0	0	0
1	0	0	1	0	0	1
1	0	1	0	0	0	1
1	0	1	1	0	0	1
1	1	0	0	0	1	0
1	1	0	1	1	1	1
1	1	1	0	0	0	1
1	1	1	1	1	0	1



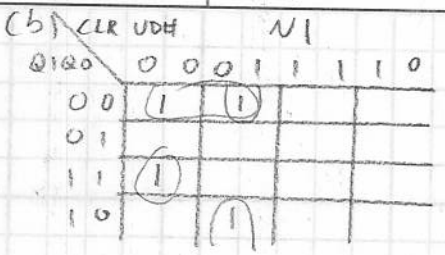
$Z = Q0 + Q1$

14.4

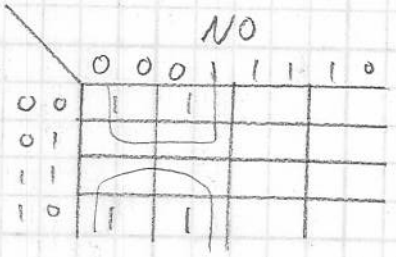
(a)

CLR	UD#	Q1	Q0	N1	N0
0	0	0	0	1	1
0	0	0	1	0	0
0	0	1	0	0	1
0	0	1	1	1	0
0	1	0	0	0	1
0	1	0	1	1	0
0	1	1	0	1	1
0	1	1	1	0	0
1	0	0	0	0	0
1	0	0	1	0	0
1	0	1	0	0	0
1	0	1	1	0	0
1	1	0	0	0	0
1	1	0	1	0	0
1	1	1	0	0	0
1	1	1	1	0	0

(b)

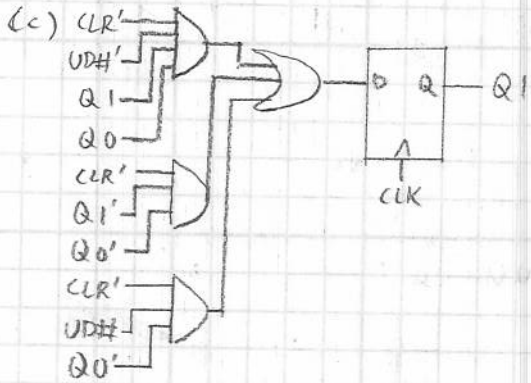


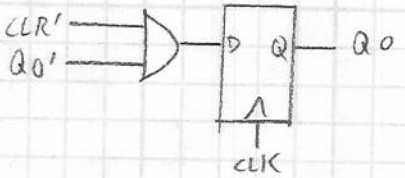
$N1 = CLR' \cdot UD\#' \cdot Q1 \cdot Q0 + CLR' \cdot Q1' \cdot Q0' + CLR' \cdot UD\# \cdot Q0'$



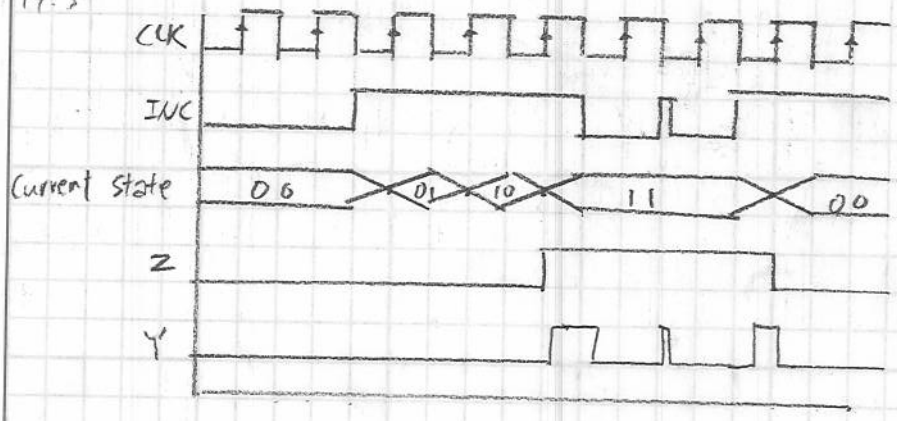
$N0 = CLR' \cdot Q0'$

(c)





14.5



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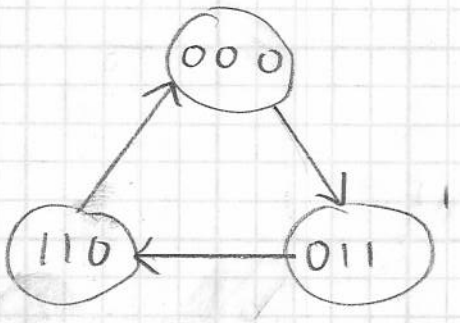
14.6

CLR	INC	Q1	Q0	N1	N0
0	0	0	0	0	0
0	0	0	1	0	1
0	0	1	0	1	0
0	0	1	1	1	1
0	1	0	0	0	1
0	1	0	1	1	0
0	1	1	0	1	1
0	1	1	1	0	0
1	0	0	0	0	0
1	0	0	1	0	0
1	0	1	0	0	0
1	0	1	1	0	0
1	1	0	0	0	1
1	1	0	1	1	0
1	1	1	0	0	1
1	1	1	1	0	0

when Q1Q0 = 00, 01, 11 and INC = CLR = 1, it increments
when Q1Q0 = 10 and INC = CLR = 1 it decrements

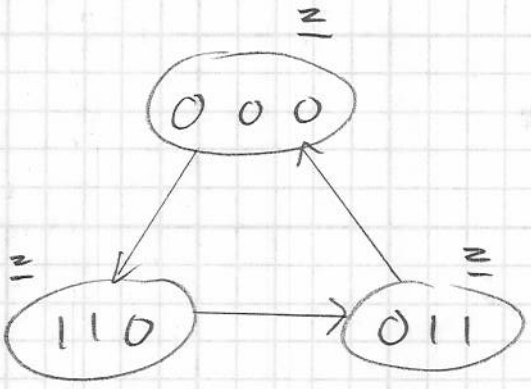
15.1

Q2	Q1	Q0	N2	N1	N0
0	0	0	0	1	1
0	0	1	X	X	X
0	1	0	X	X	X
0	1	1	1	1	0
1	0	0	X	X	X
1	0	1	X	X	X
1	1	0	0	0	0
1	1	1	X	X	X

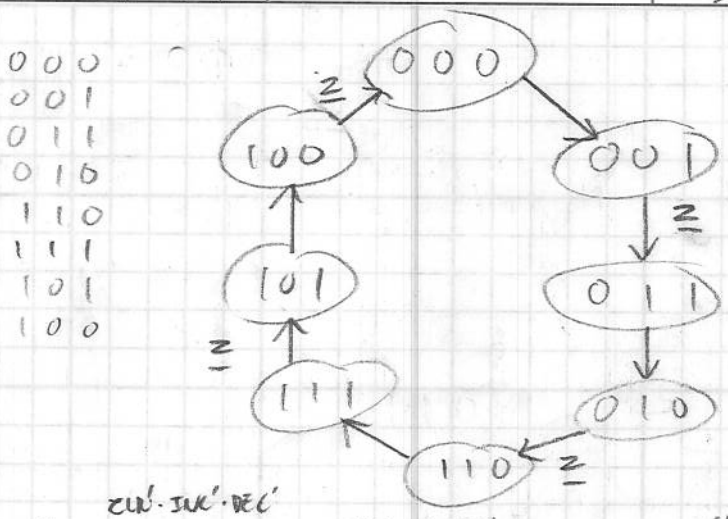


15.2

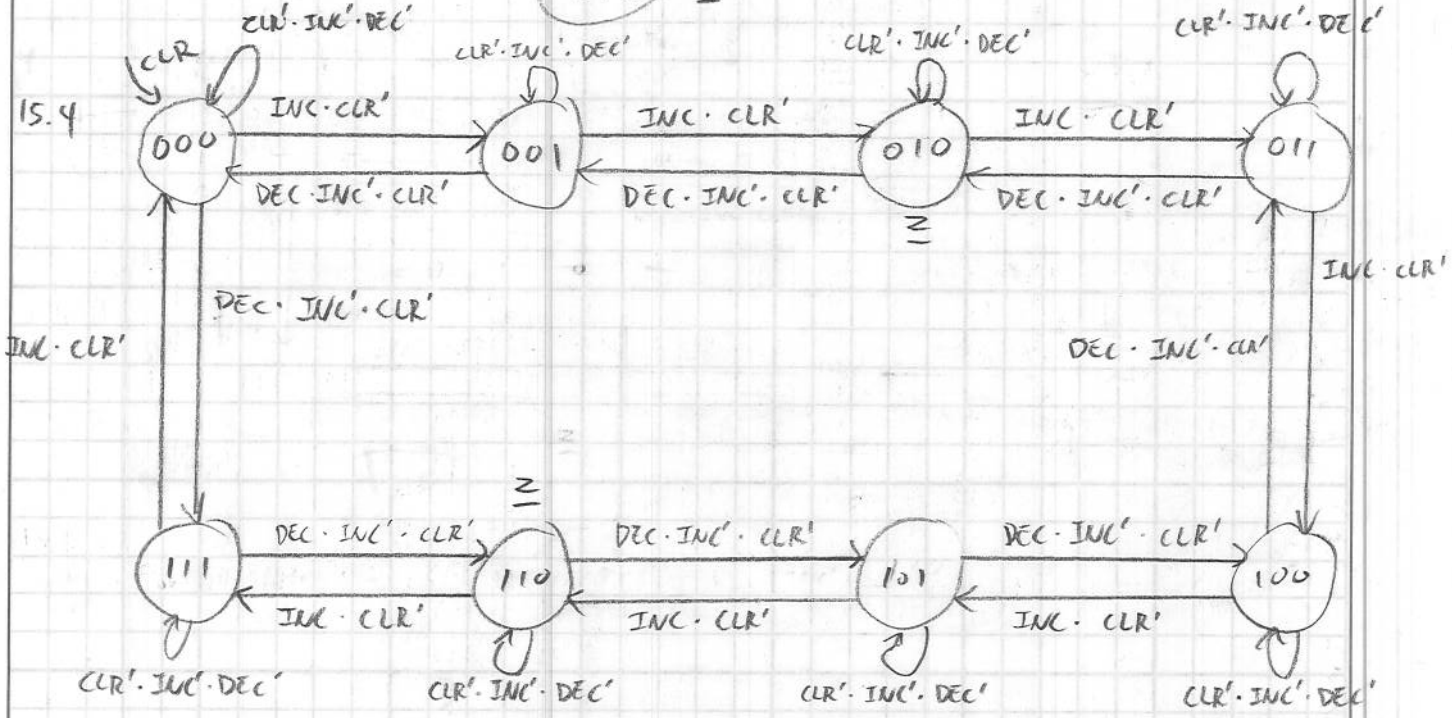
Q2	Q1	Q0	N2	N1	N0	Z
0	0	0	1	1	0	1
0	0	1	X	X	X	X
0	1	0	X	X	X	X
0	1	1	0	0	0	1
1	0	0	X	X	X	X
1	0	1	X	X	X	X
1	1	0	0	1	1	1
1	1	1	X	X	X	X



15.3



15.4



15.5 For all states: $CLR + CLR' \cdot INC' \cdot DEC' + DEC \cdot INC' \cdot CLR' + INC \cdot CLR'$

$= CLR + CLR' \cdot INC' + INC \cdot CLR'$

$= CLR + CLR'$

$= 1$

For all states:

$\overline{CLR} \cdot (\overline{CLR' \cdot INC' \cdot DEC'}) = 0$

$\overline{CLR} \cdot (INC \cdot \overline{CLR'}) = 0$

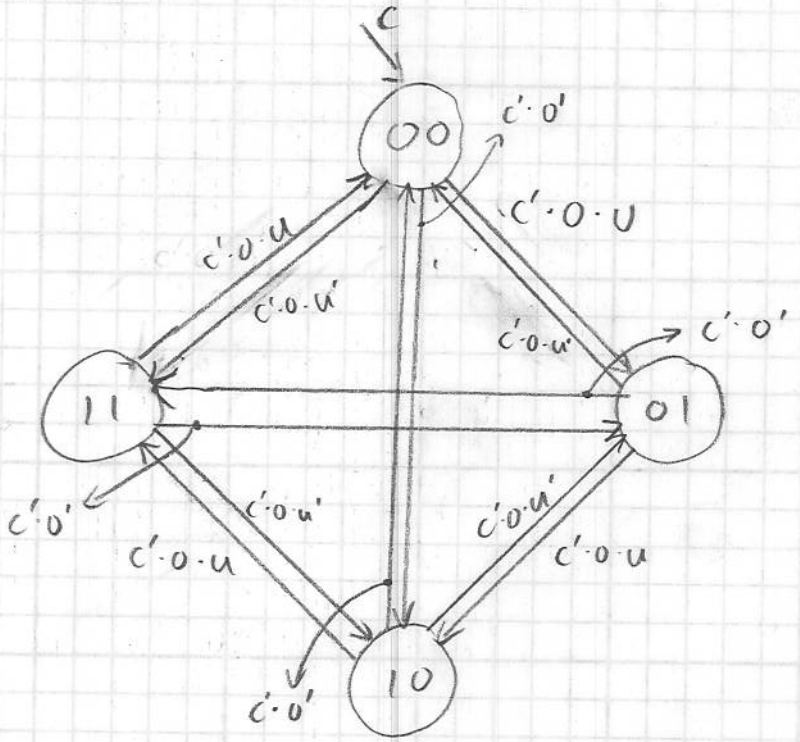
$\overline{CLR} \cdot (DEC \cdot \overline{INC' \cdot CLR'}) = 0$

$(\overline{CLR' \cdot INC' \cdot DEC'}) \cdot (\overline{INC \cdot CLR'}) = 0$

$(CLR' \cdot \overline{INC' \cdot DEC'}) \cdot \overline{DEC \cdot INC' \cdot CLR'} = 0$

$(\overline{INC \cdot CLR'}) \cdot (DEC \cdot \overline{INC' \cdot CLR'}) = 0$

15.6 CLR = C
ONE/TWO # = O
UP/DOWN # = U



C	O	U	Q1	Q0	N1	N0
1	–	–	–	–	0	0
0	0	–	0	0	1	0
0	0	–	0	1	1	1
0	0	–	1	0	0	0
0	0	–	1	1	0	0
0	1	0	0	0	1	1
0	1	0	0	1	1	0
0	1	0	1	0	0	1
0	1	0	1	1	0	0
0	1	1	0	0	0	1
0	1	1	0	1	1	0
0	1	1	1	0	1	1
0	1	1	1	1	0	0