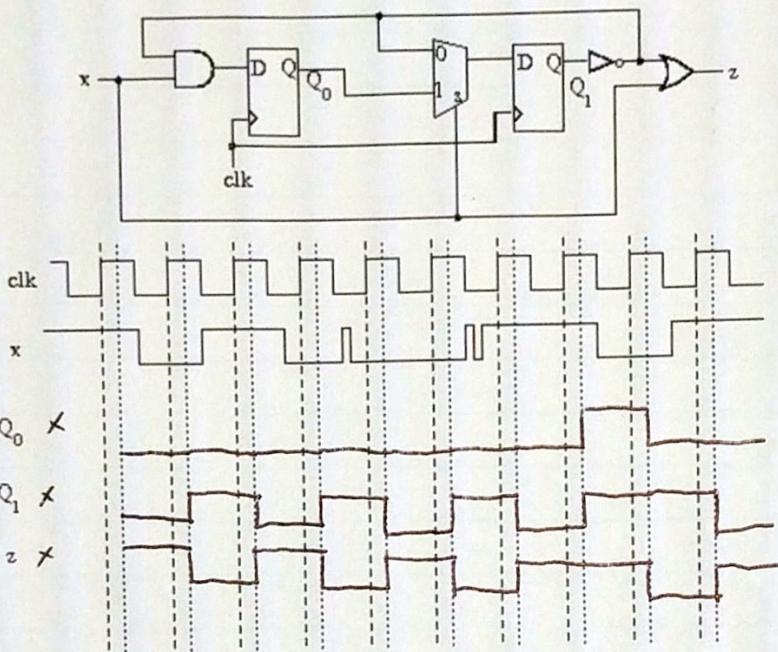


Justin Fortner
11/12/17
ID# 1481447

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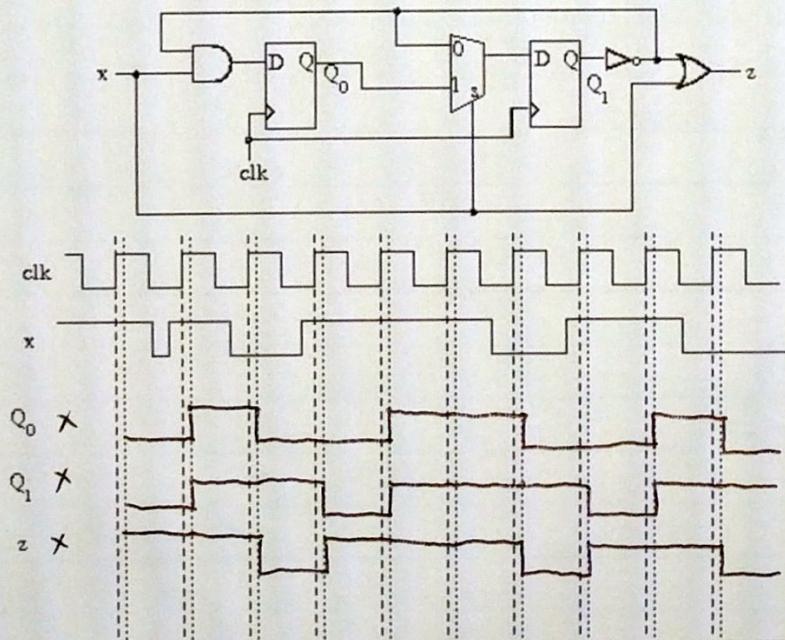
CE100 HW#4

1)



X47000.00

2)



Py2/8

$$3) D_0 = \bar{x}(Q_1 + Q_0)$$

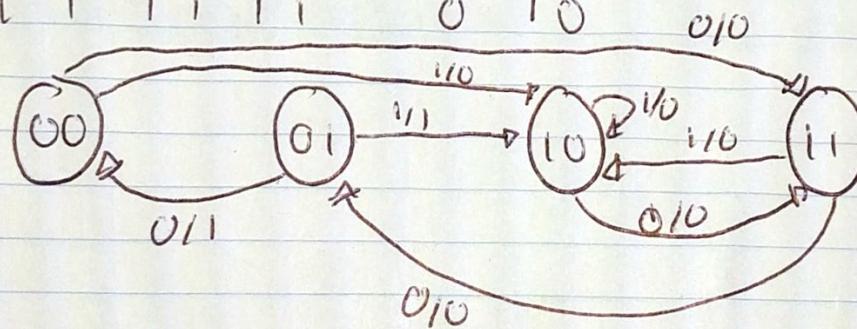
$$Q_1^+ = D_1 = \bar{Q}_0 + x$$

$$D_1 = \bar{Q}_0 + x$$

$$Q_0^+ = D_0 = x(Q_1 + \bar{Q}_0)$$

$$z = \bar{Q}_1 Q_0$$

PS			NS		Moore Machine
Q_1	Q_0	x	Q_1^+	Q_0^+	
0	0	0	1	1	0
0	1	0	0	0	1
1	0	0	1	1	0
1	1	0	0	1	0
0	0	1	1	0	0
0	1	1	1	0	1
1	0	1	1	0	0
1	1	1	0	0	0



PS		CE	NS			TL	D ₂ D ₁ D ₀		
Q_2	Q_1, Q_0		Q_2^+	Q_1^+	Q_0^+		D ₂	D ₁	D ₀
0	0 0	0	0	0	0	0	0	0	0
0	0 1	0	0	0	1	0	0	0	1
0	1 0	0	0	1	0	0	0	1	0
0	1 1	0	0	1	1	0	0	1	1
1	0 0	0	1	0	0	0	1	0	0
1	0 1	0	1	0	1	0	1	0	1
1	1 0	0	1	1	0	1	1	0	0
1	1 1	0	1	1	1	0	1	1	1

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4 (cont) PS

$Q_2\ Q_1\ Q_0$	$C\bar{E}$	\bar{Q}_2^+	$Q_1^+\ Q_0^+$	G	$D_2\ P_1\ D_0$
0 0 0	1	1	0 1	0	1 0 1
0 0 1	1	1	1 0	0	1 1 0
0 1 0	1	1	1 1	0	1 1 1
0 1 1	1	0 0	1	0	0 0 1
1 0 0	1	x x	x	0	x x x
1 0 1	1	0 1	0	0	0 1 0
1 1 0	1	0 0 0		1	0 0 0
1 1 1	1	0 1 1		0	0 1 1

\bar{Q}_2

D_2

Q_1

0	1	D	D
0	1	0	1
0	1	0	0
0	1	0	D

$\bar{C}\bar{E}$

Q_0

PFs
 $\bar{Q}_2\ \bar{C}\bar{E}$ ess
 $Q_2\ Q_1\ Q_0$
 $C\bar{E}\bar{Q}_2\ Q_0$
 $C\bar{E}\bar{Q}_2\ Q_1$ ess
 $C\bar{E}\bar{Q}_2\ Q_0$ ess

$$D_2 = Q_2\bar{C}\bar{E} + C\bar{E}\bar{Q}_2\bar{Q}_1 + C\bar{E}\bar{Q}_2\bar{Q}_0$$

P_1

0	0	D	0
0	0	1	1
1	1	0	0
1	1	1	D

Q_0

PIs
 $\bar{Q}_1\bar{C}\bar{E}$ ess
 $Q_1\bar{Q}_0$ ess
 $C\bar{E}\bar{Q}_0\bar{Q}_1$ ess

$$D_1 = Q_1\bar{C}\bar{E} + Q_1\bar{Q}_0 + C\bar{E}\bar{Q}_0\bar{Q}_1$$

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4 cont)

D_0

Q_2

Q_1

0	0	D	1
1	1	0	0
1	1	0	1
0	0	1	1

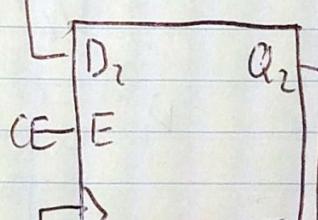
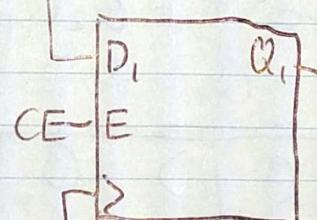
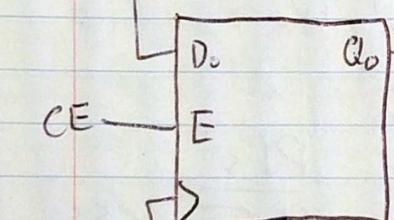
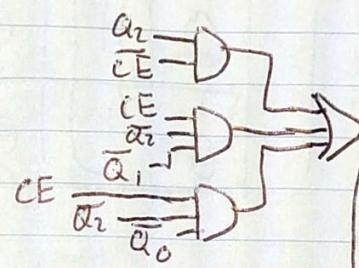
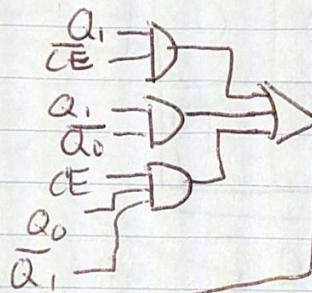
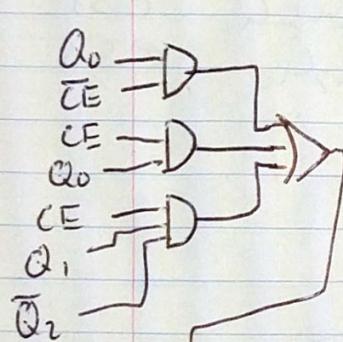
$| Q_0$

\overline{CE}

PFS
 $\overline{Q_0} \overline{CE}$ ess
 $\overline{CE} \overline{Q_0}$ es
 $\overline{CE} Q_1 \overline{Q_2}$ ess

$$D_0 = Q_0 \overline{CE} + CE \overline{Q}_0 + CE Q_1 \overline{Q}_2$$

$$TC = Q_2 Q_1 \overline{Q}_0$$



Clk

TC

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5) a) PS

$Q_2 Q_1 Q_0$	NS	$Q_2^+ Q_1^+ Q_0^+$	out	\overline{CE}	$\overline{D_2} \quad D_1 \quad D_0$
0 0 0	Q ₂ ⁺ Q ₁ ⁺ Q ₀ ⁺	1 0 0	1	0	1 0 0
0 0 1	Q ₂ ⁺ Q ₁ ⁺ Q ₀ ⁺	1 0 1	1	0	1 0 1
0 1 0	Q ₂ ⁺ Q ₁ ⁺ Q ₀ ⁺	0 0 1	0	0	0 0 1
0 1 1	Q ₂ ⁺ Q ₁ ⁺ Q ₀ ⁺	0 1 0	0	0	0 1 0
1 0 0	Q ₂ ⁺ Q ₁ ⁺ Q ₀ ⁺	0 1 0	0	0	0 1 0
1 0 1	Q ₂ ⁺ Q ₁ ⁺ Q ₀ ⁺	1 0 1	1	0	1 0 1
0 0 0	Q ₂ ⁺ Q ₁ ⁺ Q ₀ ⁺	1 0 1	1	1	1 0 1
0 0 1	Q ₂ ⁺ Q ₁ ⁺ Q ₀ ⁺	1 0 1	1	1	1 0 1
0 1 0	Q ₂ ⁺ Q ₁ ⁺ Q ₀ ⁺	0 1 1	0	1	0 1 1
0 1 1	Q ₂ ⁺ Q ₁ ⁺ Q ₀ ⁺	0 0 0	1	1	0 0 0
1 0 0	Q ₂ ⁺ Q ₁ ⁺ Q ₀ ⁺	0 1 0	0	1	0 1 0
1 0 1	Q ₂ ⁺ Q ₁ ⁺ Q ₀ ⁺	1 0 0	1	1	1 0 0

b)

D_2	Q_2	Q_1	Q_0
1	0 0 1	1 1 1	1
0	1 1 1	1 1 1	1
0	0 0 0	0 0 0	0

\times ~~CE~~ ~~MAX~~

PIs
 $Q_0 Q_1$
 $\bar{Q}_1 Q_2$ esc
 $Q_0 \bar{Q}_1$

$$D_2 = \bar{Q}_1 \bar{Q}_2 + Q_0 \bar{Q}_1$$

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5 (cont) b (cont)

D_1	$\overline{Q_2}$			
Q_1	0	1	1	0
	0	0	0	0
	1	D	D	0
	0	D	D	X

PES

$\overline{Q_0} Q_2$ ess
 $Q_0 Q_1 X$ ess
 $Q_0 Q_1 X$ ess

$$D_1 = \overline{Q_0} Q_2 + \overline{Q_0} Q_1 X + Q_0 Q_1 \overline{X}$$

D_0	$\overline{Q_2}$			
Q_1	0	0	0	1
	1	0	1	0
	0	D	D	0
	1	D	D	X

PFS

$\overline{Q_0} Q_1$ ess
 $Q_0 \overline{Q}_1 X$ ess
 $Q_1 \overline{Q}_2 X$ ess
 $Q_0 Q_1 Q_2$

$$D_0 = \overline{Q_0} Q_1 + Q_0 \overline{Q}_1 X + \overline{Q}_1 \overline{Q}_2 X$$

Out

Q_0	$\overline{Q_1}$			
	1	0	D	0
	1	0	D	0
	0	D	D	$\overline{Q_2}$
	0	D	D	Q_2

PIS

$\overline{Q}_1 \overline{Q}_2$ es1

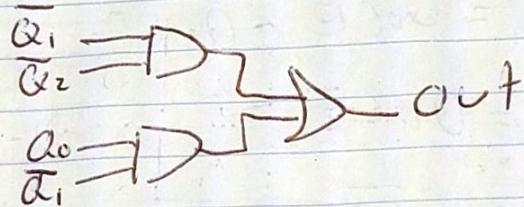
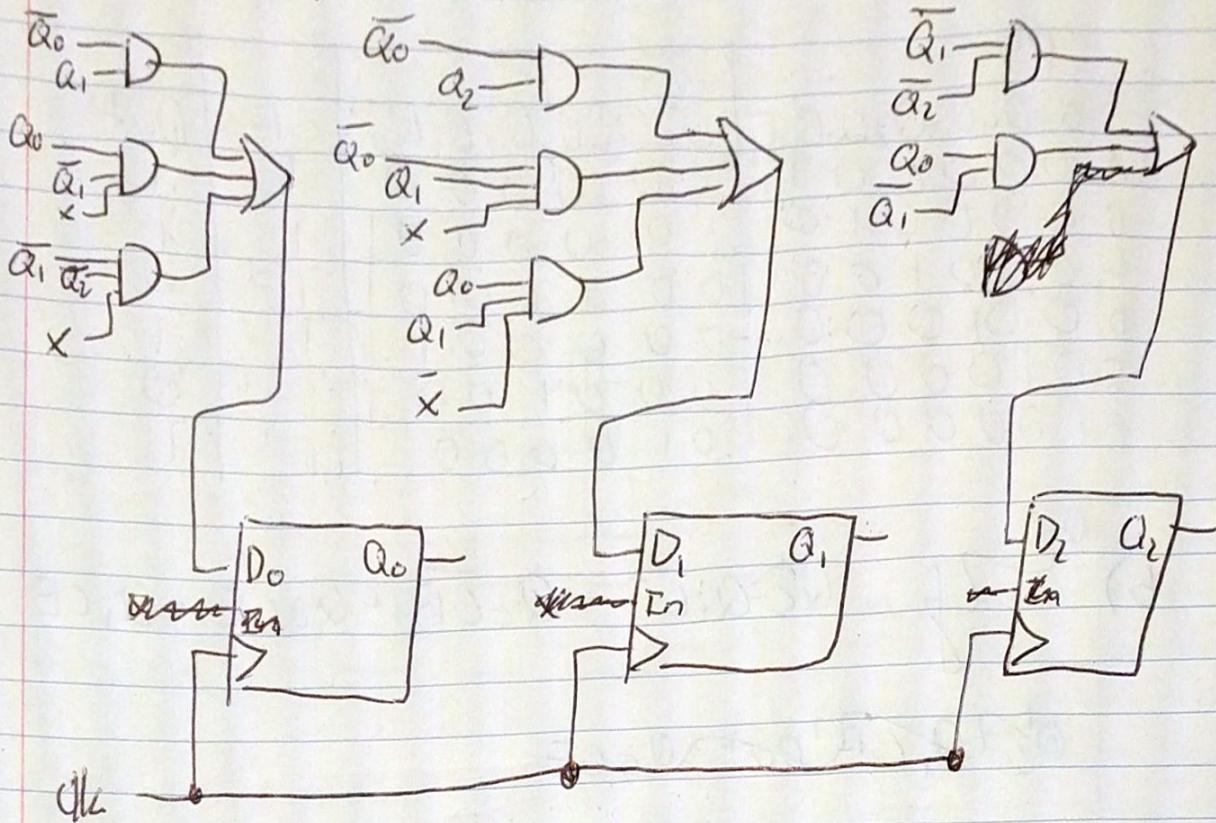
$Q_0 Q_2$
 $Q_0 \overline{Q}_1$

$$\text{out} = \overline{Q}_1 \overline{Q}_2 + Q_0 \overline{Q}_1$$

Q₁

py 7/8

S(cont) BC



a) cost gates 14 gates

24 literals

6) PS

	Q5	Q4	Q3	Q2	Q1	Q0
A	0	0	0	0	0	1
B	0	0	0	0	1	0
C	0	0	0	1	0	0
D	0	0	1	0	0	0
E	0	1	0	0	0	0
F	0	0	0	0	0	0

N _S	CE	out
Q ₅ ⁺ Q ₄ ⁺ Q ₃ ⁺ Q ₂ ⁺ Q ₁ ⁺ Q ₀ ⁺	0	1
0 1 0 0 0 0	0	1
1 0 0 0 0 0	0	0
0 0 0 0 1 0	0	0
0 0 0 1 0 0	0	0
0 0 0 1 0 0	0	0
0 0 0 0 0 0	0	1

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6 cont)

PS	NS	CE	Out
A 0 0 0 0 0 0 1	Q ₅ ⁺ Q ₄ ⁺ Q ₃ ⁺ Q ₂ ⁺ Q ₁ ⁺ Q ₀ ⁺	1	1
B 0 0 0 0 0 1 0	1 0 0 0 0 0 0	1	1
C 0 0 0 1 0 0 0	1 0 0 0 0 0 0	1	0
D 0 0 1 0 0 0 0	0 0 1 0 0 0 0	1	1
E 0 1 0 0 0 0 0	0 0 0 1 0 0 0	1	0
F 1 0 0 0 0 0 0	0 1 0 0 0 0 0	1	1

b) $Q_5^+ = Q_1 \bar{CE} + Q_5 \bar{C}\bar{E} + Q_0 CE + Q_1 CE$

~~$Q_5^+ = Q_1 \bar{C}\bar{E} + Q_0 CE + Q_5 CE$~~

$Q_5^+ = Q_0 \bar{CE} + Q_5 CE$

$Q_5^+ = Q_2 CE$

$Q_5^+ = Q_3 \bar{CE} + Q_4 \bar{CE} + Q_4 CE$

$Q_5^+ = Q_2 \bar{CE}$

$Q_5^+ = Q_3 CE$

c) 15 gates

24 literals