یا لطیف

رضا آذین پور
۹۸۱۴۳۰۳
تمرین سری ۴: سیستم دیجیتال

#1

$$f(x) = \begin{cases} 3x & ; x<5 \\ x-2 & ; 5 \le x < 9 \\ \begin{cases} 0 : x, \text{odd} \\ 1 : x, \text{even} \end{cases} & x \ge 9 \end{cases}$$

Y_0 ↑ Y_1 ← Y_2 ← Y_3

	X_0	X_1	X_2	X_3	Y_0	Y_1	Y_2	Y_3
0:	0	0	0	0	0			
1:	0	0	0	1	3			
2:	0	0	1	0	6			
3:	0	0	1	1	9			
4:	0	1	0	0	12			
5:	0	1	0	1		3		
6:	0	1	1	0		4		
7:	0	1	1	1		5		
8:	1	0	0	0		6		
9:	1	0	0	1			0	
10:	1	0	1	0				1
11:	1	0	1	1			0	
12:	1	1	0	0				1
13:	1	1	0	1			0	
14:	1	1	1	0				1
15:	1	1	1	1			0	

Y_0 :

0	0	0	0
0	0	1	1
0	1	1	0
1	0	0	1
1	1	0	0

Y_1 :

0	0	1	1
0	1	0	0
0	1	0	1
0	1	1	0

for Y_0 :

X_0X_1 \ X_2X_3	00	01	11	10
00	1		1	
01				1
11	1			
10		1		

for Y_1 :

X_0X_1 \ X_2X_3	00	01	11	10
00			1	
01	1	1		1
11				
10				

for Y_2 :

X_0X_1 \ X_2X_3	00	01	11	10
00	1			
01				
11				
10				

X_0X_1 \ X_2X_3	00	01	11	10
00				
01				
11			1	
10				

#2

	x	y	z	A	B	C
0:	0	0	0	0	1	0
1:	0	0	1	1	0	0
2:	0	1	0	1	1	0
3:	0	1	1	1	0	0
4:	1	0	0	0	0	1
5:	1	0	1	0	1	0
6:	1	1	0	1	0	0
7:	1	1	1	1	0	1

for A :

x \ yz	00	01	11	10
0	1		1	1
1			1	

$yz + \bar{x}y + \bar{x}z$

for B :

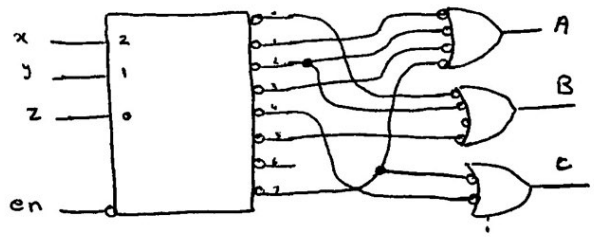
x \ yz	00	01	11	10
0	1			1
1		1		

$\bar{x}\bar{z} + x\bar{y}z$

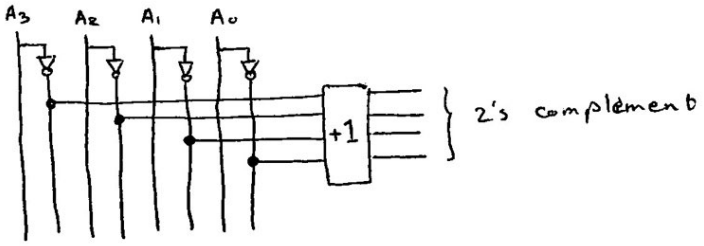
for C :

x \ yz	00	01	11	10
0				
1	1		1	

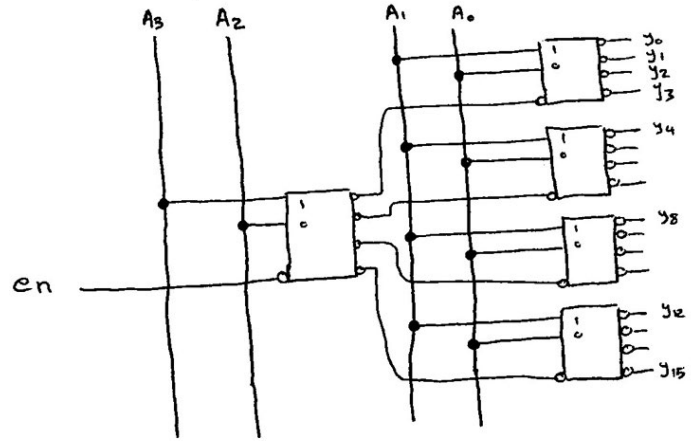
$x\bar{y}\bar{z} + xyz$



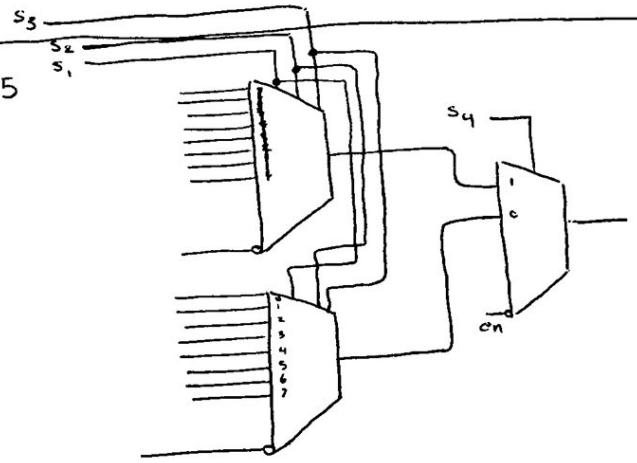
#3



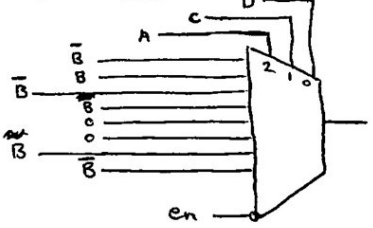
#4



#5

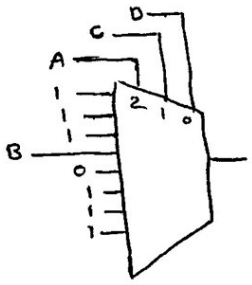


#6 a) $F(A,B,C,D) = \sum(0,2,5,7,11,14)$



CD / AB	00	01	11	10
00	1			1
01		1	1	
11				1
10			1	

b) $F(A,B,C,D) = \prod(3,8,12)$

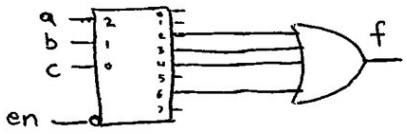


CD / AB	00	01	11	10
00	1	1		1
01	1	1	1	1
11		1	1	1
10		1	1	1

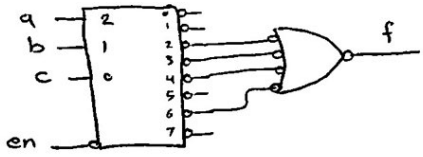
#7 $f(a,b,c) = a\bar{c} + \bar{a}b = a\bar{c}(b+\bar{b}) + \bar{a}b(c+\bar{c}) = ab\bar{c} + a\bar{b}\bar{c} + \bar{a}bc + \bar{a}b\bar{c}$

$f(a,b,c) = \sum(6,4,3,2)$

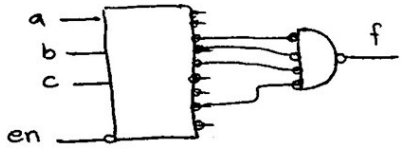
a)



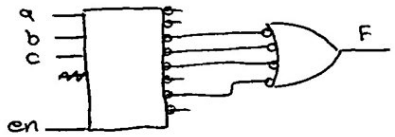
b)



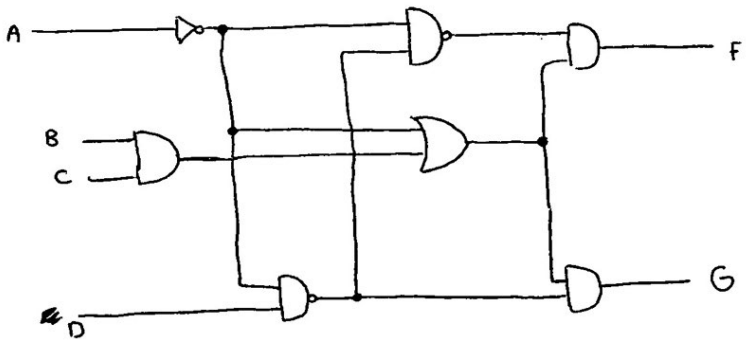
c)



d)



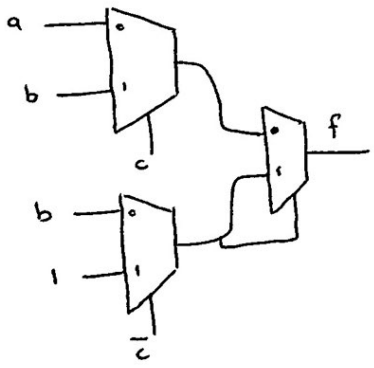
#8



$F = (\bar{A} + (BC)) \cdot \overline{(\bar{A} \cdot (\bar{A}D))} = (\bar{A} + (BC)) \cdot (A + \bar{D}) = \bar{A}D + ABC + BC\bar{D}$

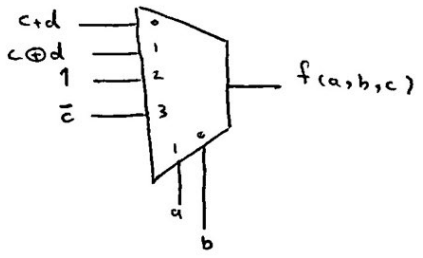
$G = (\bar{A} + (BC)) \cdot \overline{(D\bar{A})} = (\bar{A} + (BC)) \cdot (\bar{D} + A) = \bar{A}\bar{D} + BC\bar{D} + BCA$

#9



if $c = 0 \rightarrow f = 1$

if $c = 1 \rightarrow f = b$



if a b	→	f(a,b,c)
0 0	→	c+d
0 1	→	c⊕d
1 0	→	1
1 1	→	$\bar{c}$