

MSIA HW#5

1a)

	x_0			
x_1	1	0	0	1
x_2	1	1	0	0
	x_1			

1b) $F = x_2 x_1' + x_2' x_0'$

1c) $F = (x_2 + x_0')(x_2' + x_1')$

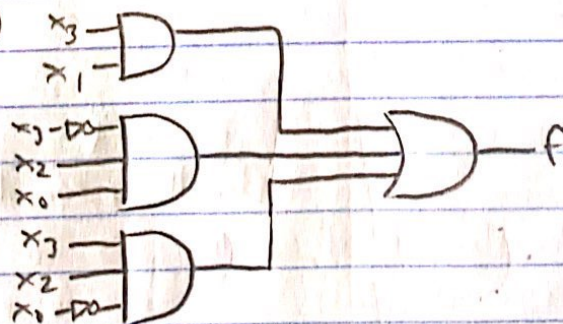
2a)

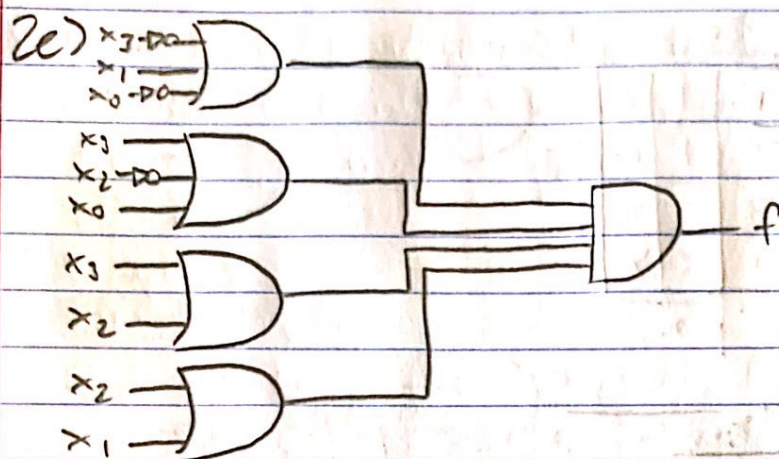
	x_0			
	0	0	0	0
	0	1	1	0
x_3	1	0	1	1
	0	0	1	1
	x_1			

2b) $f = x_3 x_1 + x_3' x_2 x_0 + x_3 x_2 x_0'$

2c) $f = (x_3' + x_1 + x_0')(x_3 + x_2' + x_0)(x_3 + x_2)(x_2 + x_1)$

2d)





3a)

x_3	x_2	x_1	x_0	z_1	z_0
0	0	0	0	0	0
0	0	0	1	1	0
0	0	1	0	0	0
0	0	1	1	1	0
0	1	0	0	0	0
0	1	0	1	1	1
0	1	1	0	0	1
0	1	1	1	1	1
1	0	0	0	0	1
1	0	0	1	1	1
1	0	1	0	x	x
1	0	1	1	x	x
1	1	0	0	x	x
1	1	0	1	x	x
1	1	1	0	x	x
1	1	1	1	x	x

3b) z_1 :

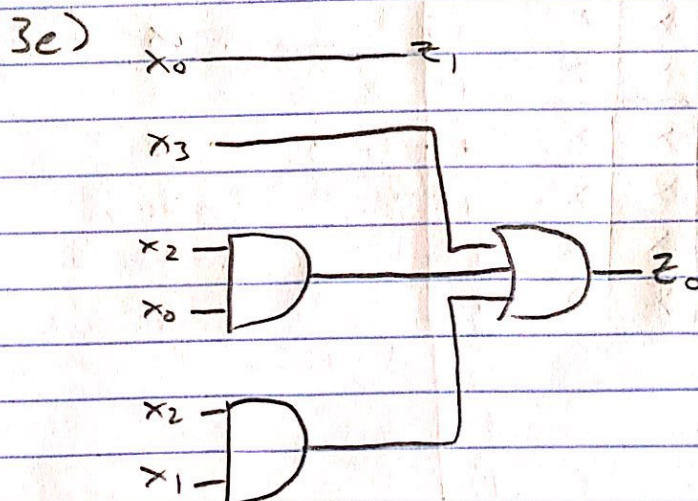
		x_0				
		0	1	1	0	
		0	1	1	0	
x_3		x	x	x	x	x_2
		0	1	x	x	
		x_1				

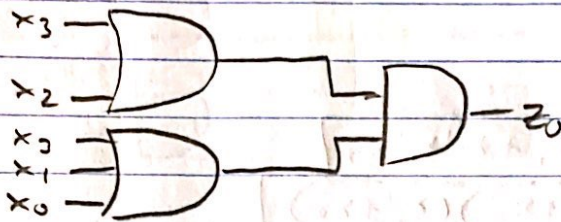
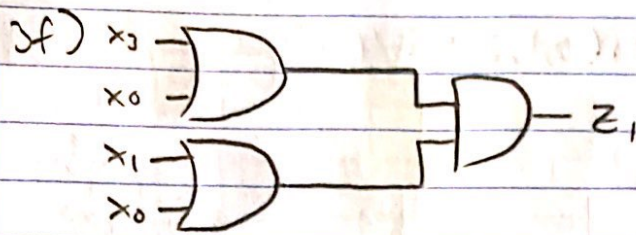
z_0 :

		x_0				
		0	0	0	0	
		0	1	1	1	
x_3		x	x	x	x	x_2
		1	1	x	x	
		x_1				

3c) $z_1 = x_0$
 $z_0 = x_3 + x_2x_0 + x_2x_1$

3d) $z_1 = (x_3 + x_0)(x_1 + x_0)$
 $z_0 = (x_3 + x_2)(x_3 + x_1 + x_0)$





4a) $F(x_3, x_2, x_1, x_0) = \prod M(1, 3, 4, 7, 10, 13, 14, 15)$

		x_0				
		1	0	0	1	
		0	1	0	1	
x_3		1	0	0	0	x_2
		1	1	1	0	
		x_1				

SOP: $x_3'x_2x_1'x_0 + x_3'x_1x_0' + x_3'x_2'x_0' + x_3x_1'x_0' + x_3x_2'x_0 = F$

POS: $F = (x_3 + x_2' + x_1 + x_0)(x_3 + x_2 + x_0')(x_2' + x_1' + x_0')(x_3' + x_2' + x_0')(x_3' + x_1' + x_0)$

4b) $F(x_3, x_2, x_1, x_0) = \sum m(0, 4, 5, 9, 11, 14, 15)$; $D(x_3, x_2, x_1, x_0) = \sum m(2), m(8)$

		x_0				
		1	0	0	X	
		1	1	0	0	
x_3		0	0	1	1	x_2
		X	0	1	0	
		x_1				

SOP: $F = x_3x_2x_1 + x_3x_1x_0 + x_3'x_1'x_0' + x_3'x_2x_1'$

POS: $F = (x_3' + x_1)(x_3 + x_1')(x_3 + x_2 + x_0')(x_2 + x_1' + x_0)$

4c) $F(x_3, x_2, x_1, x_0) = \sum m(0, 1, 2, 5, 8, 9, 10)$

		x_0				
		1	1	0	1	
		0	1	0	0	
x_3	1	0	0	0	0	x_2
	0	1	1	0	1	
		x_1				

SOP: $F = x_2'x_0' + x_2'x_1' + x_3'x_1'x_0'$

POS: $F = (x_1' + x_0')(x_3' + x_2')(x_2' + x_0)$

4d) $F(x_2, x_1, x_0) = \sum m(0, 1, 4, 6)$

	x_0			
	1	1	0	0
x_2	1	0	0	1
	x_1			

SOP: $F = x_2'x_1' + x_2x_0'$

POS: $F = (x_2 + x_1')(x_2' + x_0')$

5a)

x_3	x_2	x_1	x_0	z
0	0	0	0	0
0	0	0	1	0
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	1
0	1	1	0	1
0	1	1	1	0
1	0	0	0	1
1	0	0	1	1

$\sum m(2, 3, 4, 5, 6, 8, 9)$

$\prod M(0, 1, 7)$

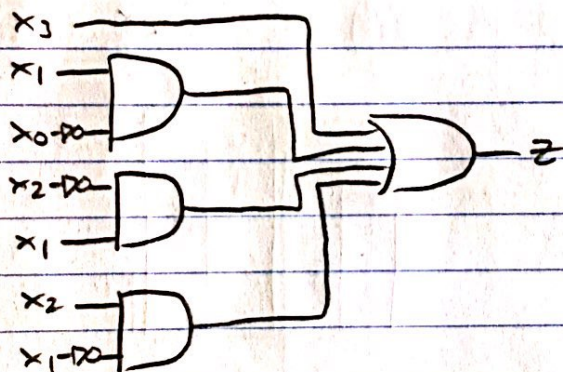
5b)

		x_0			
		0	0	1	1
		1	1	0	1
x_3		X	X	X	X
		1	1	X	X
		x_1			
		x_2			

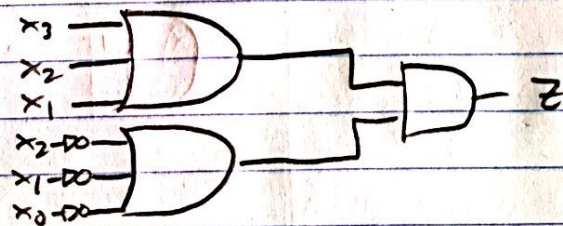
$$\text{SOP: } z = x_3 + x_1x_0' + x_2'x_1 + x_2x_1'$$

$$\text{POS: } (x_3 + x_2 + x_1)(x_2' + x_1' + x_0') = z$$

5c) SOP:



POS:



6) NAND gates cost less transistors to implement than AND/OR gates, so the use of a NAND-NAND networks is more cost-efficient, as less transistors are required.