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Academic Honesty: [signature]

MSIA HW#5

1a)

x_2 \ x_0	0	1	3	2
0	1	0	0	1
1	1	1	0	0

(x_1)

1b) $F = x_2x_1' + x_2'x_0'$

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

2a)

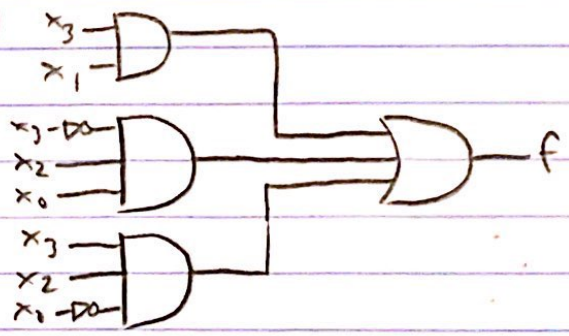
x_3 \ x_0	0	1	3	2
0	0	0	0	0
1	0	1	1	0
3	1	0	1	1
2	0	0	1	1

(x_2 on the right; x_1 on the bottom)

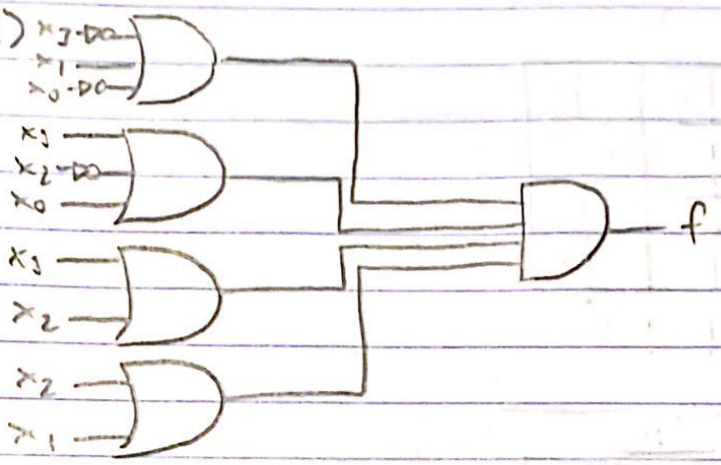
2b) $f = x_3x_1 + x_3'x_2x_0 + x_3x_2x_0'$

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

2d)



2c)



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_3 \ x_0	0	1	1	0
	0	1	1	0
	X	X	X	X
	0	1	X	X

(x_2 = rows, x_1 = columns)

z_0:

x_3 \ x_0	0	0	0	0
	0	1	1	1
	X	X	X	X
	1	1	X	X

(x_2 = rows, x_1 = columns)

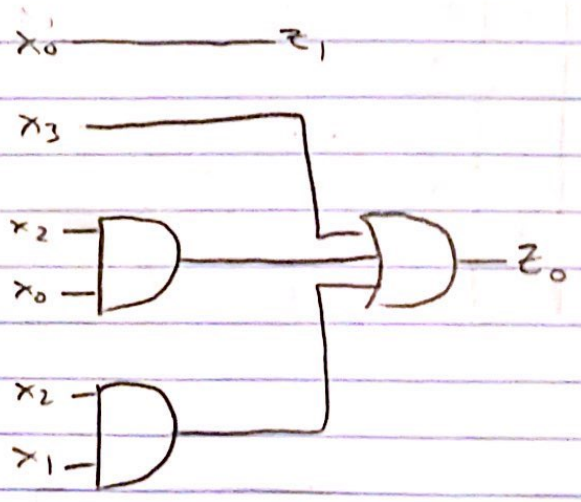
3c) $z_1 = x_0$

$z_0 = x_3 + x_2x_0 + x_2x_1$

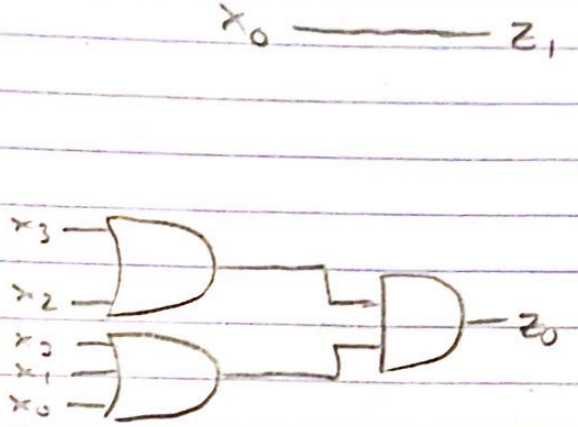
3d) $z_1 = x_0$

$z_0 = (x_3 + x_2)(x_3 + x_1 + x_0)$

3e)



4f)



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

x_3 \ x_2 \ x_0	00	01	11	10
00	1	0	0	1
01	0	1	0	1
11	1	0	0	0
10	1	1	1	0

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

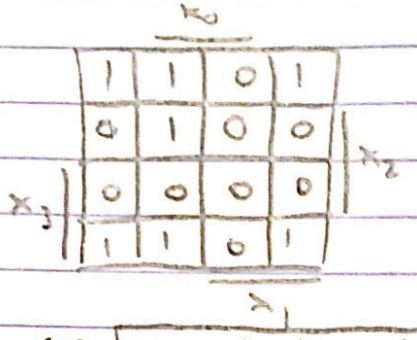
4b) $F(x_3, x_2, x_1, x_0) = \sum m(0,4,5,9,11,14,15), dc(x_3, x_2, x_1, x_0) = \{m(2), m(8)\}$

x_3 \ x_2 \ x_0	00	01	11	10
00	1	0	0	X
01	1	1	0	0
11	0	0	1	1
10	X	1	1	0

SOP: $F = x_3x_2'x_0 + x_3x_2x_1 + x_3'x_2x_1' \quad x_3'x_1'x_0'$

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

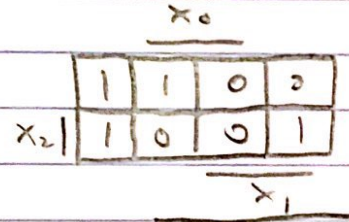
4c) $F(x_3, x_2, x_1, x_0) = \Sigma m(0,1,2,5,8,9,10)$



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



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

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

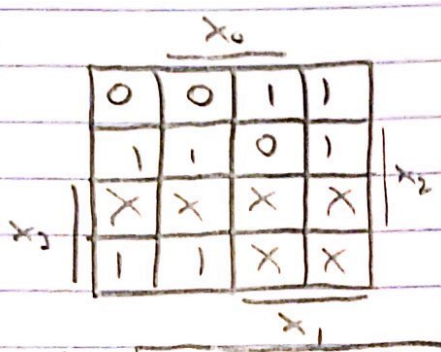
5a)

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

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

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

5b)

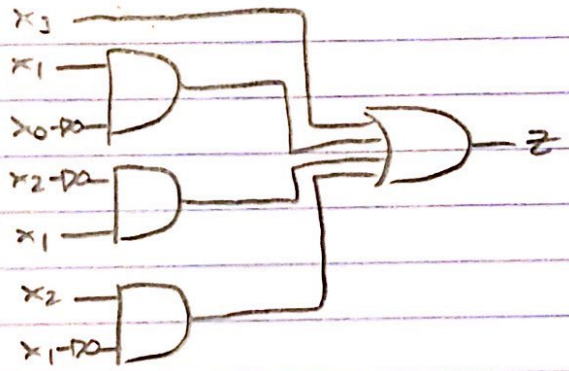


0	0	1	1
1	1	0	1
X	X	X	X
1	1	X	X

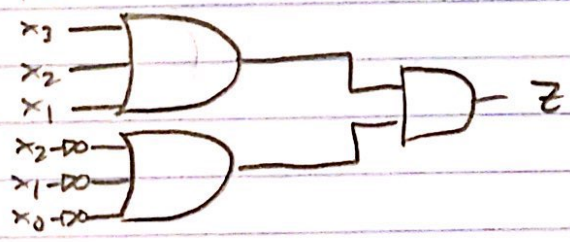
SOP: $z = x_3 + x_1x_0' + x_2'x_1 + x_2x_1'$

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.