HW2 Everette Li

1:

a> $(a+b)(a+b+c+d) = a+b$

let $(a+b) = x$

$= xa + xb + xc + xd$

$= x(a+b) + x(c+d)$

$= x + x(c+d)$

$= x.1 + x(c+d)$

$= x(1 + (c+d))$

$= x(1)$

$= x$

$= a+b$

b>

by the definition of EOR we can get:

a EOR b <=> $a+b \, . \, a'+b'$

therefor F(a, b) could be written as the following:

$ab + a'b' = (a+b \, . \, a'+b')'$

looking at R.H.S:

$(a+b \, . \, a'+b')'$

$= (a+b)' + (a'+b')'$

$= a'b' + ab$

$= ab + a'b'$

2:

a>

Table:

a	b	c	d	(a+b)(a+b+c+d)	a + b
0	0	0	0	0	0
0	0	0	1	0	0
0	0	1	1	0	0
0	1	1	1	1	1
1	1	1	1	1	1
1	1	1	0	1	1
1	1	0	0	1	1
1	0	0	0	1	1
0	0	1	0	0	0
0	1	0	0	1	1
0	1	1	0	1	1
1	0	0	1	1	1
1	1	0	1	1	1
1	0	1	1	1	1
0	1	0	1	1	1
1	0	1	0	1	1

b>

Table:

a	b	ab + a'b'	(a EOR b)'
0	0	1	1
0	1	0	0

1	0	0	0
1	1	1	1

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3:
a>
SOP:F = a'bcd+abcd+abcd'+abc'd'+ab'c'd'+a'bc'd'+a'bcd'+ab'c'd+abc'd
+ab'cd+a'bc'd+ab'cd'
POS:F = (a+b+c+d)(a+b+c+d')(a+b+c'+d')(a+b+c'+d)
b>
SOP: F = a'b'+ab
POS: F = (a+b')(a'+b)

4:(Check)
prime implicants:
w'x'
w'xz
wx'z
wx
y'z'
y'z
yz
yz'
x'z'
xz
essential prime implicants:
x'z' + xz

5:
f(w,x,y,z) = ΠM(1,3,9,11,14) + d(4,5,8,10,12,13)
f(w,x,y,z) = ((ΠM(1,3,9,11,14))')' + d(4,5,8,10,12,13)
f(w,x,y,z) = (EM(1,3,9,11,14))' + d(4,5,8,10,12,13)
f = Z(YW')

6:
1> specification: see question description of Q6.
2> Truth Table:

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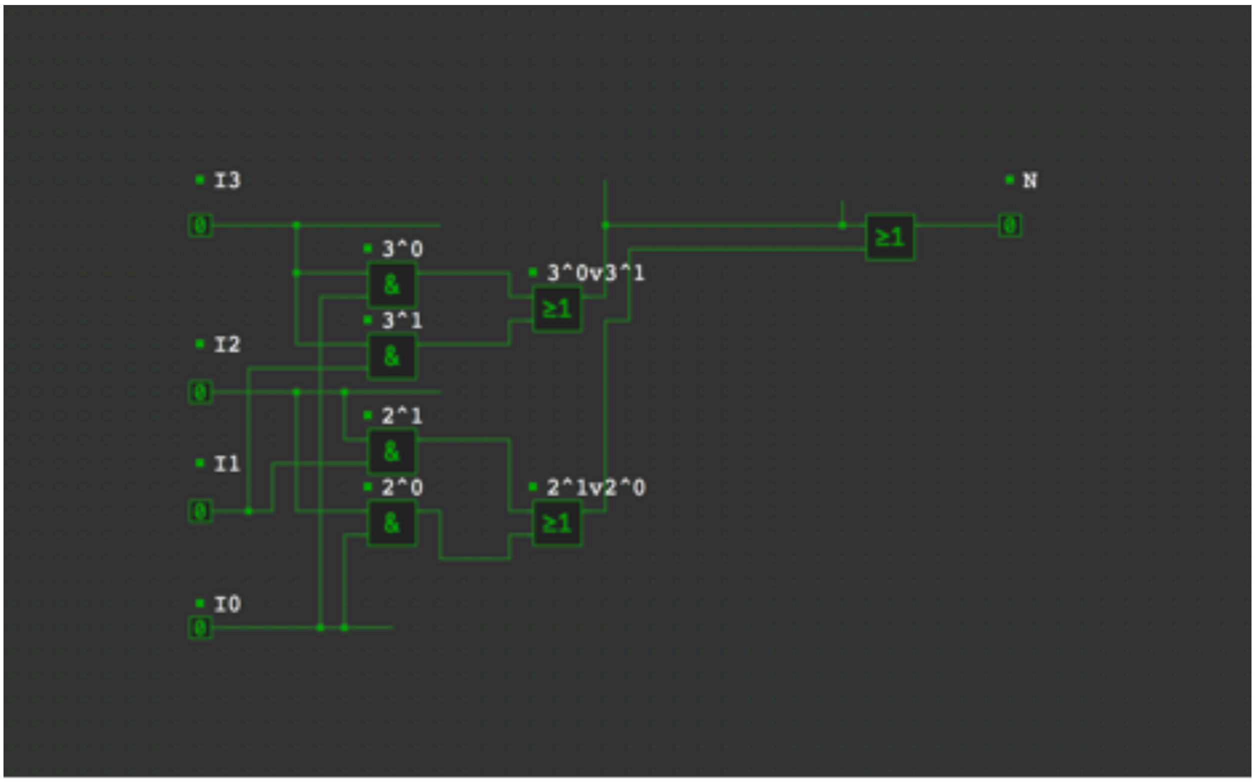
I3	2	1	0	N	P2	P1
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	0	1	0	0	0	0
0	0	1	1	0	0	0
0	1	0	0	0	0	0
0	1	0	1	1	1	1
0	1	1	0	1	0	1
0	1	1	1	1	1	0
1	0	0	0	0	0	0
1	0	0	1	1	1	0
1	0	1	0	1	1	1
1	0	1	1	1	0	1
1	1	0	0	0	0	0
1	1	0	1	1	0	1

1 | 1 | 1 | 0 ! 1 ! 1 ! 0
1 | 1 | 1 | 1 ! 1 ! 1 ! 1
==
3> Get SOP for each output:
N = Em(5,6,7,9,10,11,13,14,15)
P2 = Em(5,7,9,10,14,15)
P1 = Em(5,6,10,11,13,15)
4> simplify:
N = I2I0 + I2I1 + I3I0 + I3I1
P2 = I3I2'I1'I0 + I3'I2I0 + I1I0I2 + I1I0'I3
P1 = I1'I0I2 + I3I2I0 + I3I2'I1 + I3'I2I1I0'
5> Make logic gates



7: