

Homework 5

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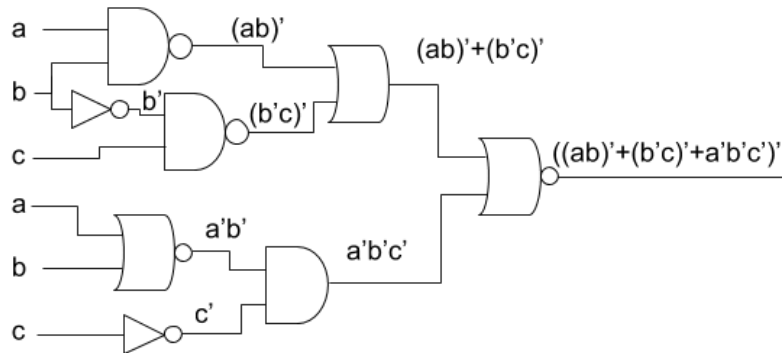
Homework 5

Problem 1

(1 point each) Draw the non-abbreviated logic diagram.

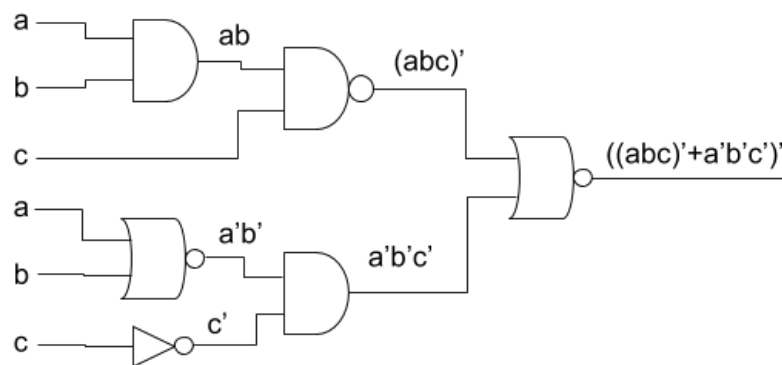
(1 point each) Construct the truth table for each.

a. $((ab)'(b'c)' + a'b'c')'$



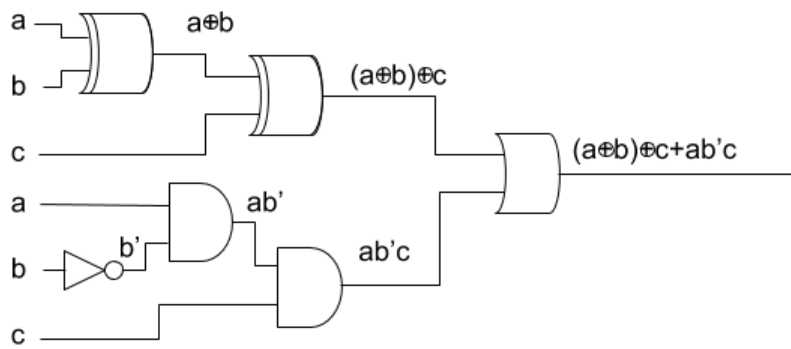
a	b	c	x
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	0

b. $((abc)' + (a'b'c'))'$



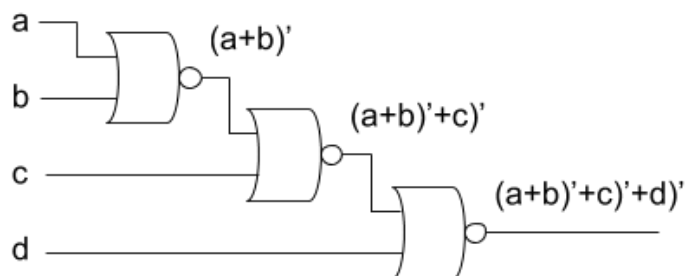
a	b	c	x
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

c. $(a \oplus b) \oplus c + ab'c$



a	b	c	x
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	1

d. $((a + b)' + c)' + d'$



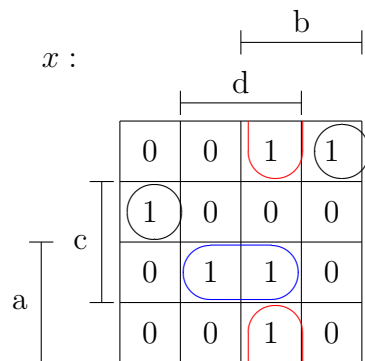
a	b	c	d	x
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

Problem 2

(3 points each) Draw a Karnaugh map.

(3 points each) Find the minimum AND-OR expression for .

a. $\Sigma(2, 4, 5, 11, 13, 15)$

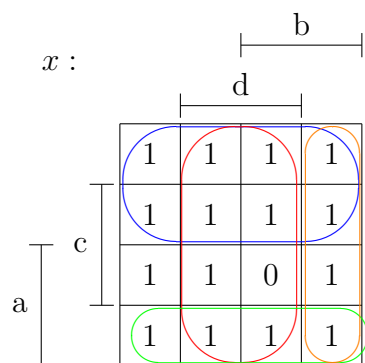


$$x(a, b, c, d) =$$

$$acd + bc'd + a'd'b'c + a'd'c'b$$

$$= d(bc' + ac) + a'd'(b'c + bc')$$

b. $\Sigma(0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14)$



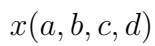
$$x(a, b, c, d)$$

$$= a' + b' + ac' + bd'$$

$$= (ab)' + ac' + bd'$$

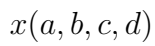
(3 points each) Draw a Karnaugh map.

a. $\Sigma(0, 3, 14) + d(2, 4, 7, 8, 10, 11, 13, 15)$



$$= ac + cd + b'd'$$

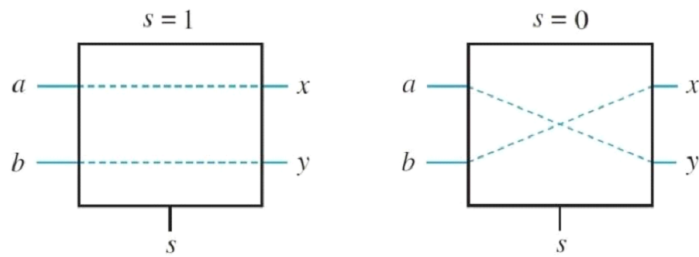
b. $\Sigma(1, 6, 9, 12) + d(0, 2, 3, 4, 5, 7, 14, 15)$



$$= bd' + b'c'd$$

Problem 4

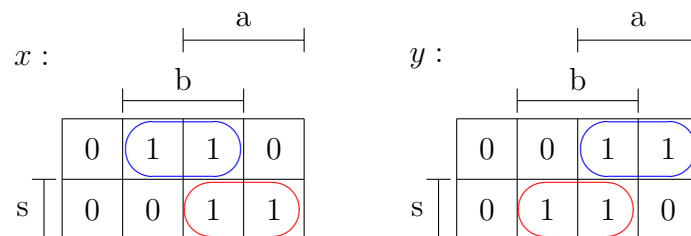
For this diagram;



- Draw the truth table.

s	a	b	x	y
1	0	0	0	0
1	0	1	0	1
1	1	0	1	0
1	1	1	1	1
0	0	0	0	0
0	0	1	1	1
0	1	0	0	1
0	1	1	1	1

- Draw 2 K-Maps one for output of x and one for output of y .

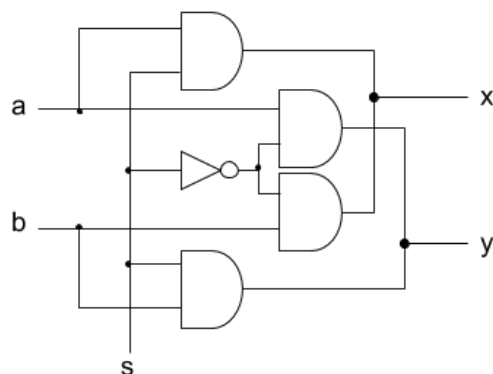


- Find & show the minimum AND-OR expressions - one for $f(x)$ and one for $f(y)$

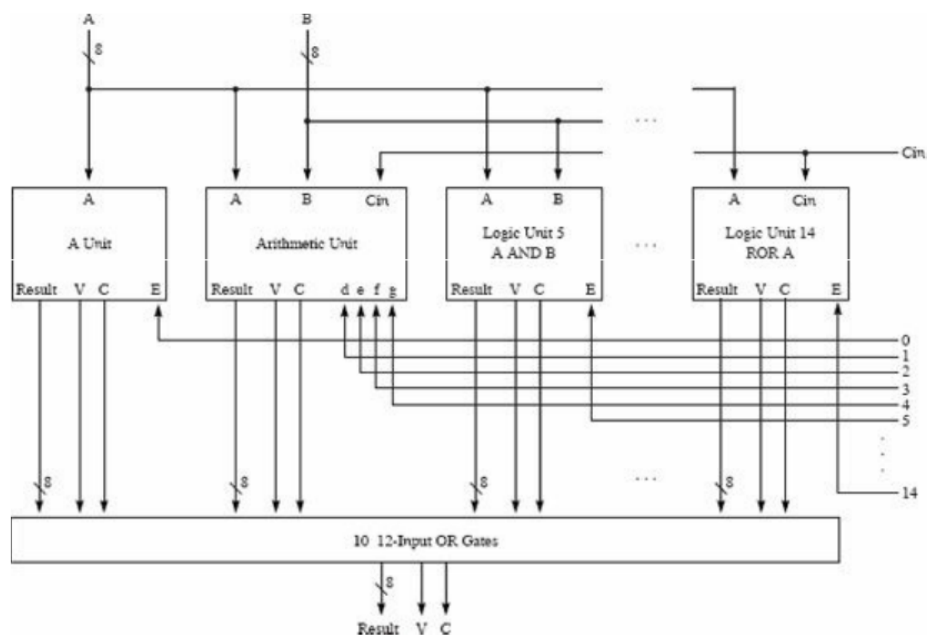
$$f(x) = sa + s'b$$

$$f(y) = sb + s'a$$

- Construct one circuit using only AND, OR, and inverter gates.

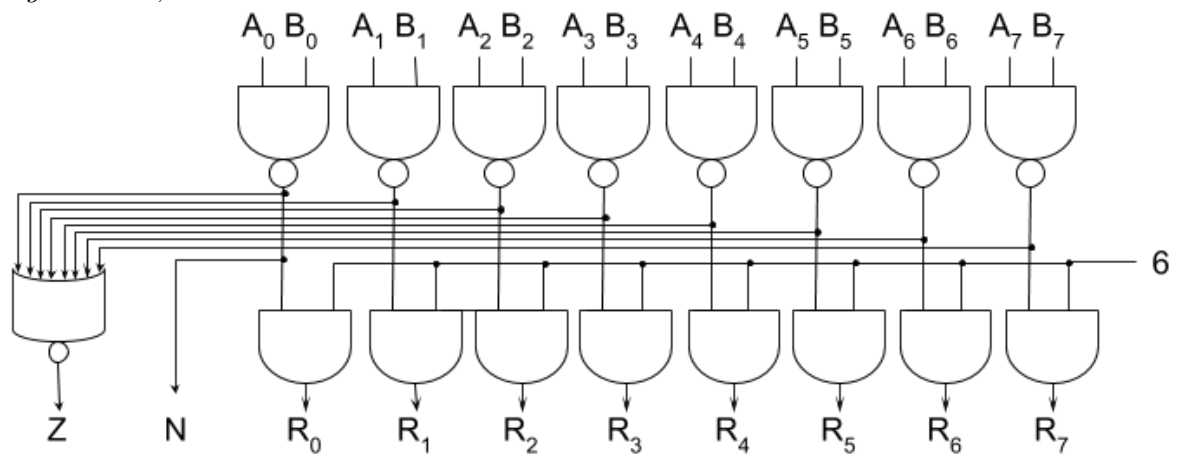


Problem 5



Implement the following logic units for the Pep/8 ALU:

Logic unit 6, $\overline{A \cdot B}$



References

Warford, J. (2009). *Computer systems* (4th ed.). Jones and Bartlett.