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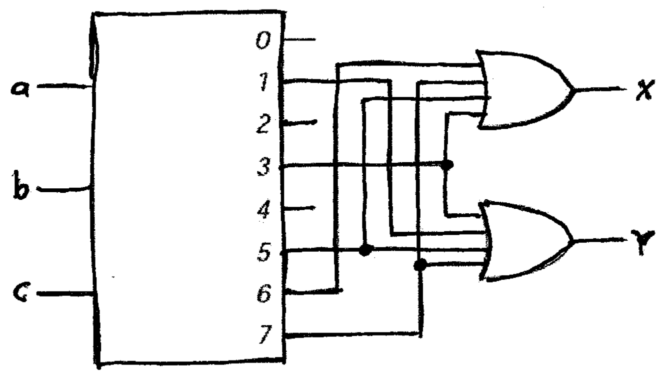
Chapter 5; Problem 7: consider the following circuit with an active high output decoder. Draw a truth table for x and y in terms of a, b and c.



Logic Expression for x and y

$$X(a,b,c) = \sum m(3,5,6,7)$$

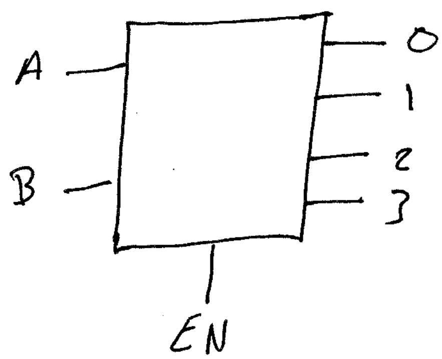
$$Y(a,b,c) = \sum m(1,3,5,7)$$

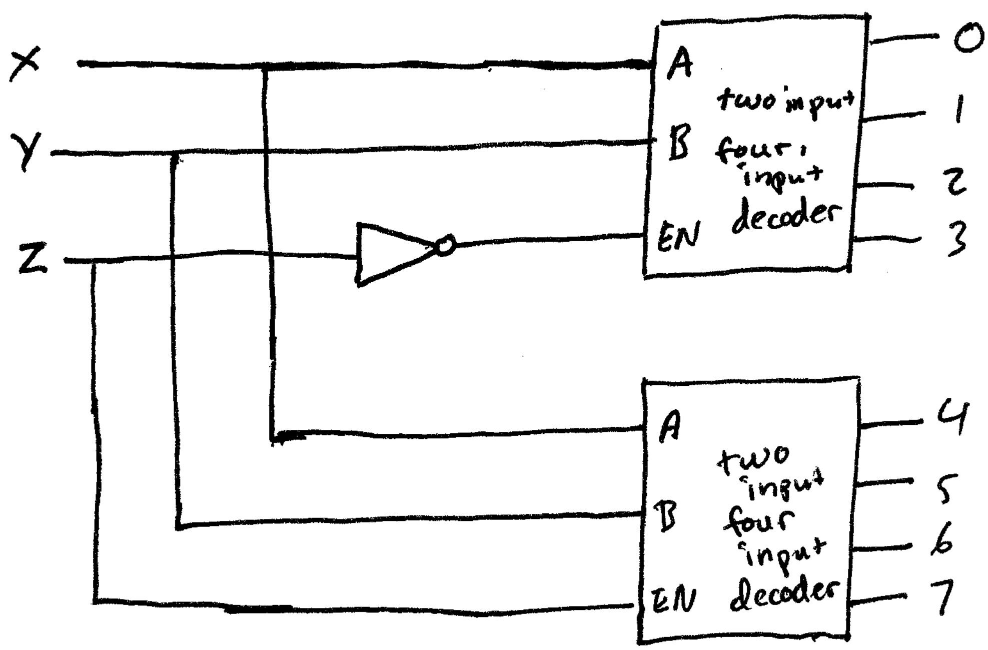
Truth Table ⇒

a	b	c	X	Y
0	0	0	0	0
0	0	1	0	1
0	1	0	0	0
0	1	1	1	1
1	0	0	0	0
1	0	1	1	1
1	1	0	1	0
1	1	1	1	1

Chapter 5 problem 8: We wish to design a decoder, with three inputs, x, y, z and eight active high outputs, labled 0, 1, 2, 3, 4, 5, 6, 7. There is no enable input required. The only building block is a two-input, four output decoder. (with an active high enable).

EN	A	B	0	1	2	3
0	x	x	0	0	0	0
1	0	0	1	0	0	0
1	0	1	0	1	0	0
1	1	0	0	0	1	0
1	1	1	0	0	0	1

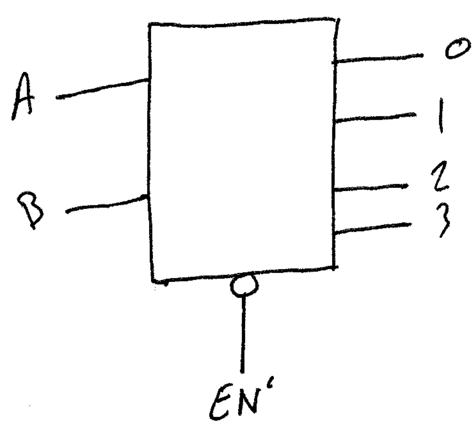




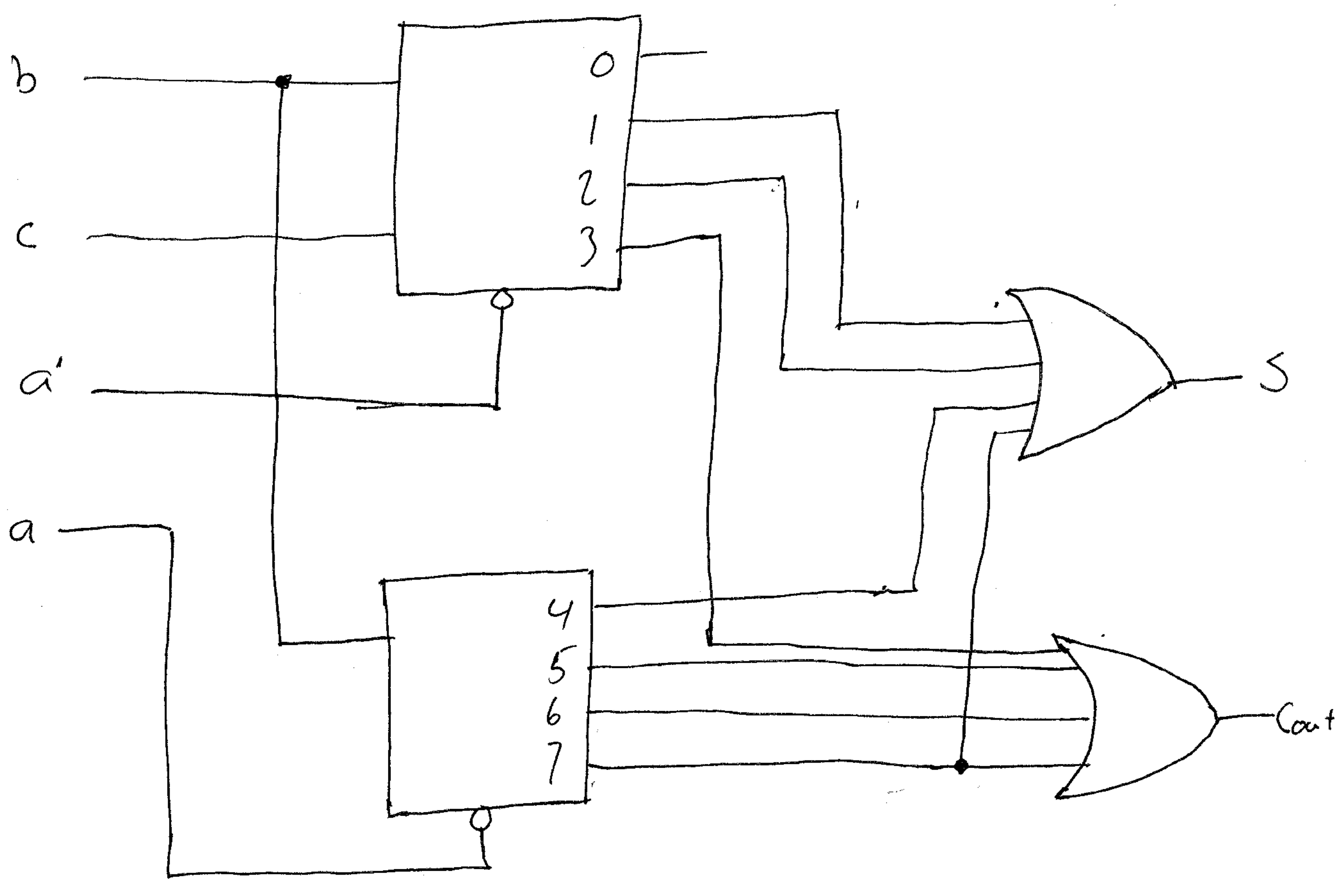
Chapter 5 problem 9: We want to implement a full adder: we'll call the inputs a, b and c and the outputs S an Cout. As always, the adder is described by the following equations.

$$S(a,b,c) = \sum m(1,2,4,7)$$
$$Cout(a,b,c) = \sum m(3,5,6,7)$$

To implement this, all we have available are two decoders and two OR gates. Inputs a and b are available both uncomplemented and complemented; c is available only uncomplemented. Show a block diagram for this system. Be sure to lable all of the inputs to the decoders.



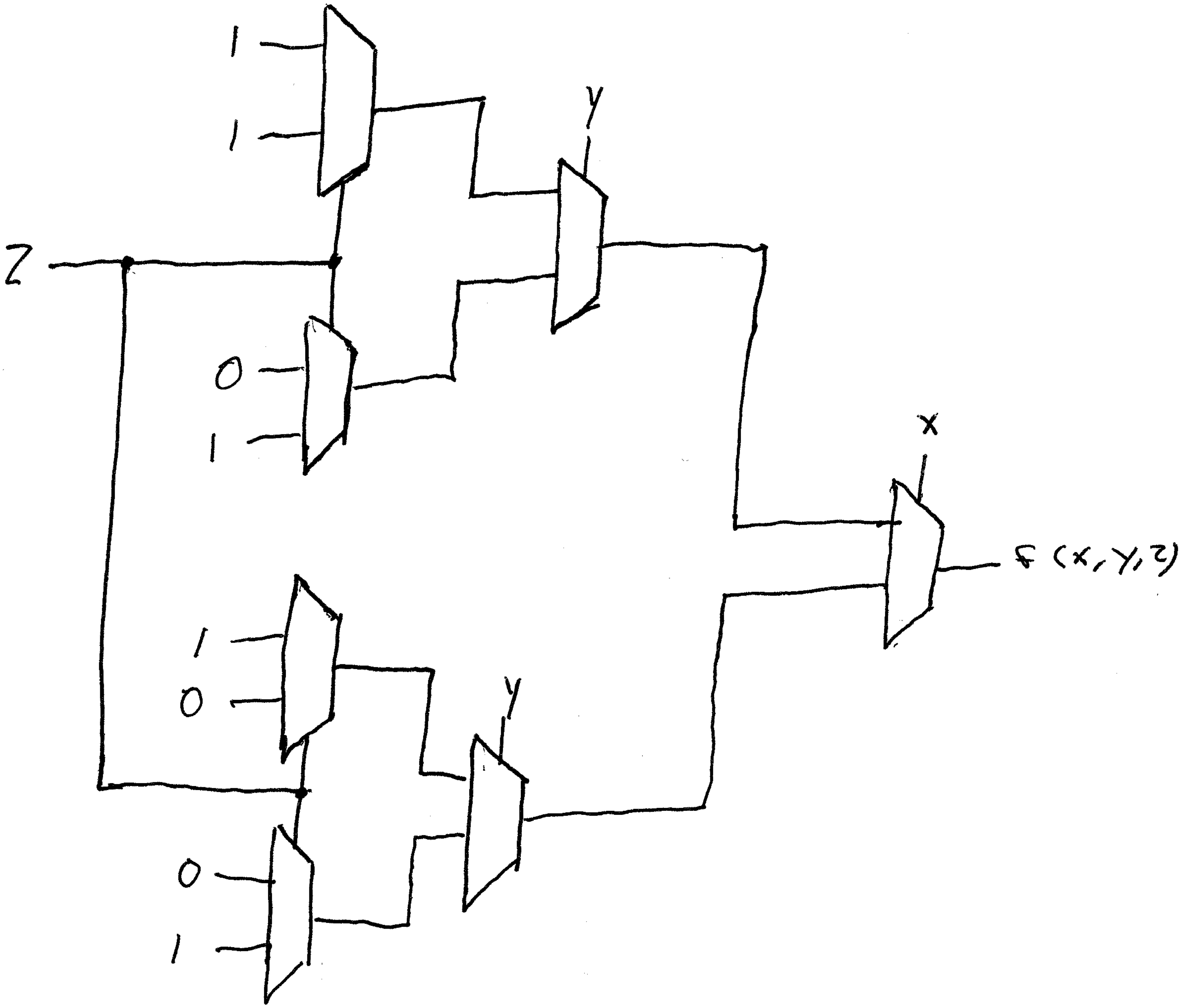
EN'	A	B	0	1	2	3
1	x	x	0	0	0	0
0	0	0	1	0	0	0
0	0	1	0	1	0	0
0	1	0	0	0	1	0
0	1	1	0	0	0	1



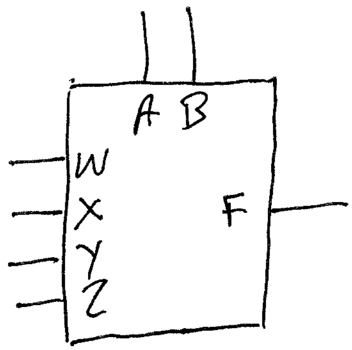
Chapter 5 problem 12: Implement the function

$$f(x, y, z) = \Sigma m(0, 1, 3, 4, 7)$$

use 2:1 multiplexers


1
1
y
Z
0
1
x
f (x, y, z)
1
0
y
0
1

Chapter 5, problem 14: The following circuit includes a multiplexer with select inputs A & B and data inputs W, X, Y and Z. Write an algebraic equation for F.



Truth Table =

A	B	F
0	0	W
0	1	X
1	0	Y
1	1	Z

Algebraic Equation:

$$F = ABW + ABX + ABY + ABZ$$

Chapter 5, problem 15: For the following sets of functions,

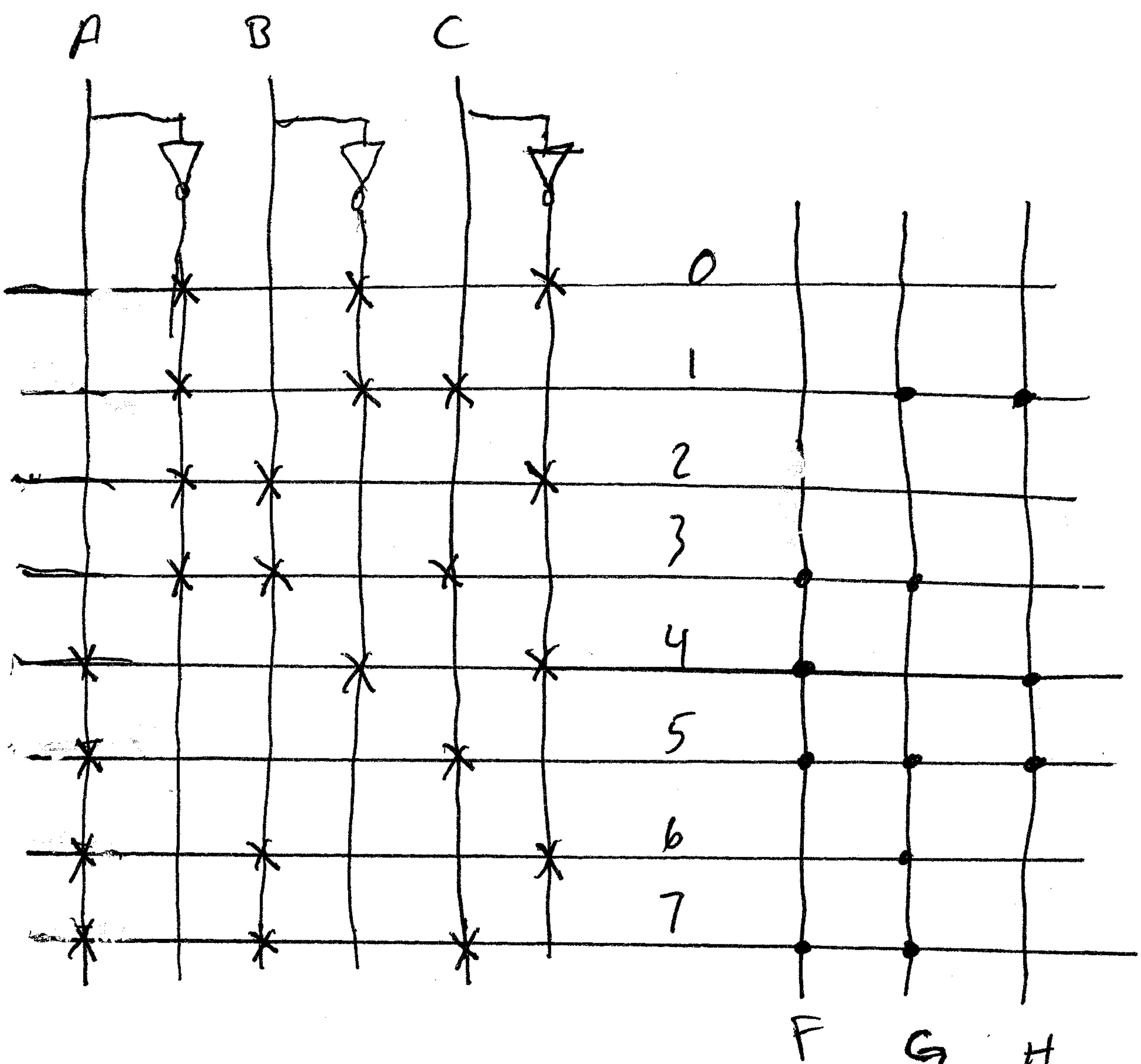
design a system

i: Using a ROM

a) $F(A,B,C) = \sum m(3,4,5,7)$

$G(A,B,C) = \sum m(1,3,5,6,7)$

$H(A,B,C) = \sum m(1,4,5)$



Chapter 5, problem 16: We have ~~found~~ a minimum sum of products expression for each of the two functions, F and G, minimizing them individually.

$$F = w'x'y + xy'z + w'z$$
$$G = wy'z + x'y'$$

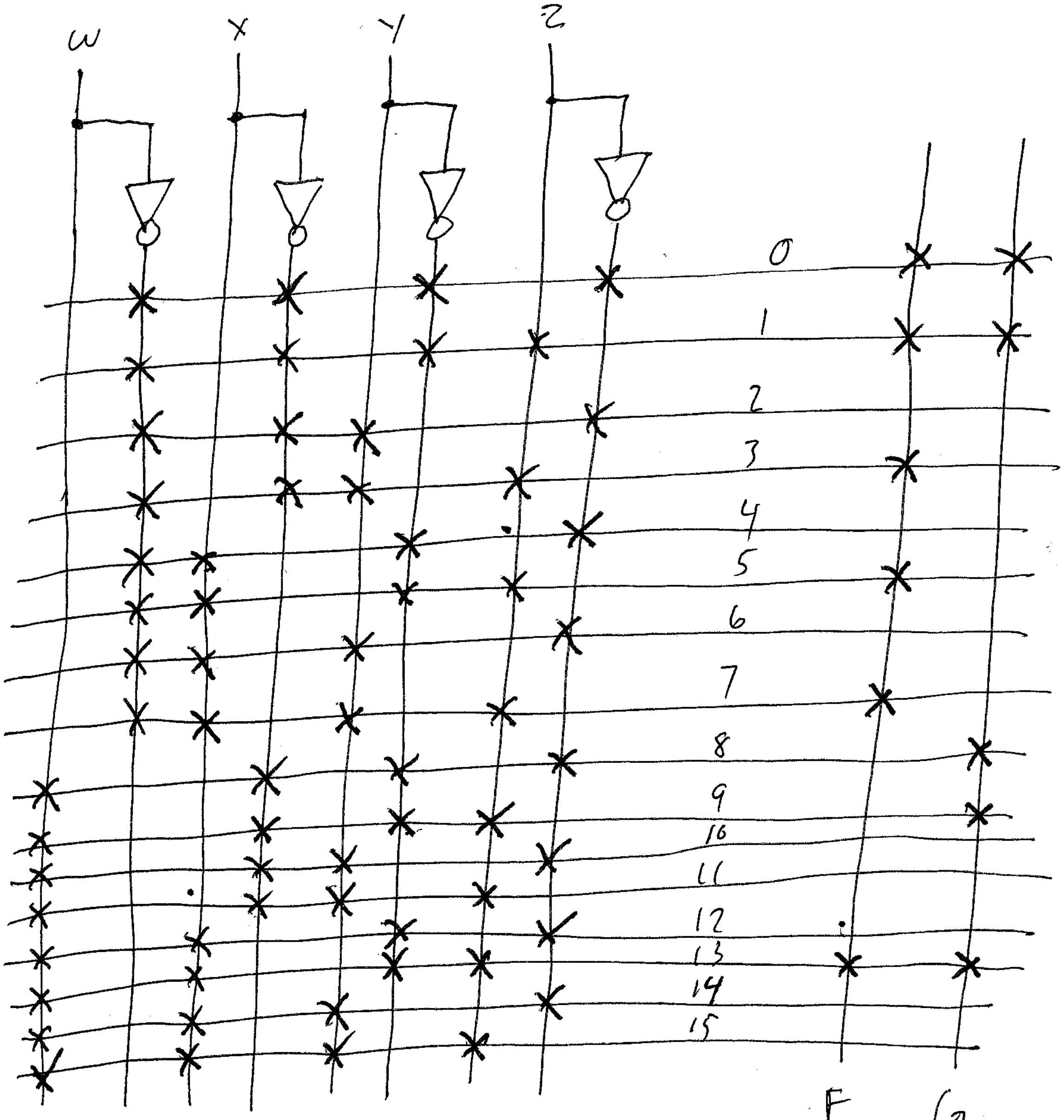
(a) Implement them with a ROM

$$F = w'x'y + xy'z + w'z$$
$$= w'x'y'(z+z) + xy'z(w+w') + w'z(x+x')(y+y')$$
$$= w'x'y'z + w'x'y'z' + wxy'z + w'xy'z + xw'z(y+y') + x'w'z(y+y')$$
$$F = w'x'y'z + w'x'y'z' + wxy'z + w'xy'z + w'xyz + w'x'yz$$

$$G = wy'z + x'y'$$
$$= wy'z(x+x') + x'y'(w+w')(z+z')$$
$$= xwy'z + x'wy'z + wx'y'(z+z') + w'x'y'(z+z')$$
$$= wxy'z + wx'y'z + wx'y'z' + wx'y'z + w'x'y'z + w'x'y'z'$$
$$G = wxy'z + wx'y'z + wx'y'z' + w'x'y'z + w'x'y'z'$$

F: yz \ wx	00	01	11	10
00	1			
01	1	1	1	
11	1	1		
10				

G: yz \ wx	00	01	11	10
00	1			1
01	1		1	1
11				
10				



(C) For the same function, we have available as many of the decoders as described in the assignment as are needed plus 2 eight-input OR gates. Show a block diagram for this implementation. All inputs are available both uncomplemented and complemented.