

1. a) (20) For the functions shown on the maps below, solve each individually for a minimum sum of products. Indicate sharing (but only if a term is part of a minimum sum of products expression for both functions). You need only show equations and one solution.

		a b			
		00	01	11	10
c d	00	1	1		
	01	1	1	1	1
	11			1	
	10				

f

		a b			
		00	01	11	10
c d	00			1	1
	01	1	1		
	11	1	1	1	
	10	1	1		

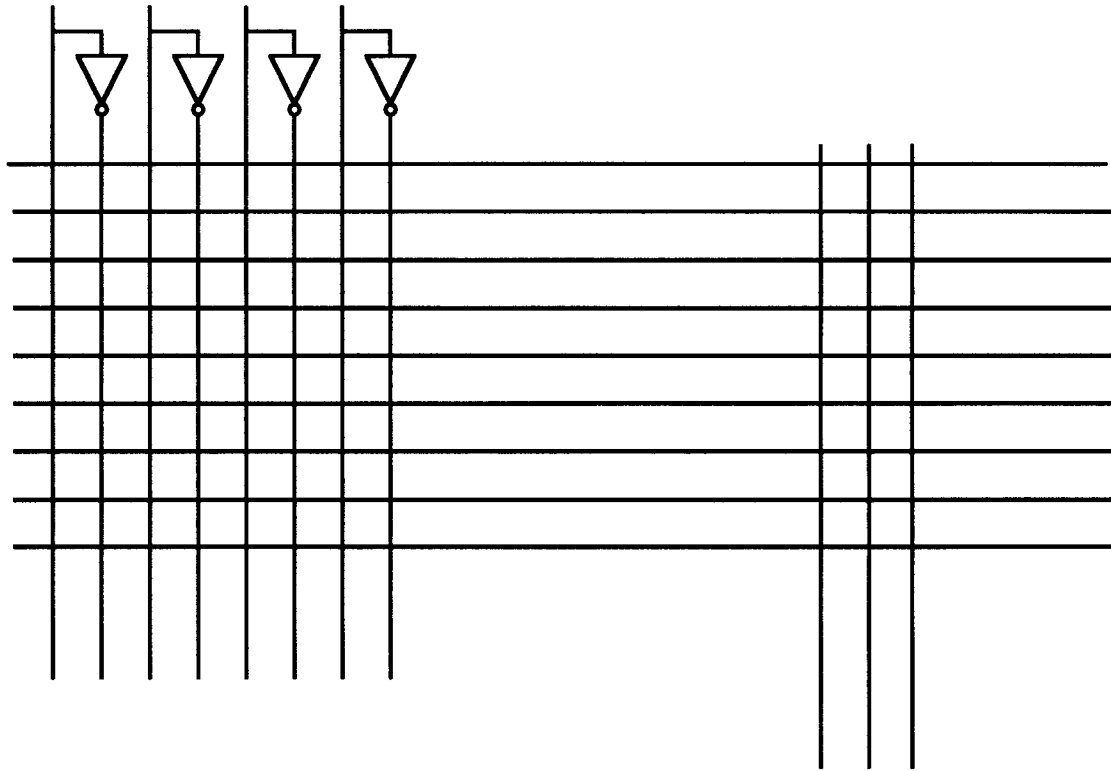
g

		a b			
		00	01	11	10
c d	00	1	1		
	01			1	1
	11			1	
	10			1	1

h

b) (15) For the same functions, find a minimum two-level AND/OR (sum of products) solution (10 gates, 33 inputs). All inputs are available both uncomplemented and complemented. Maps are repeated below. Just show the equations, but indicate sharing with underlines and/or color.

c) (15) Implement the same function with the PLA below. Full credit if you use no more than the 9 terms shown. If you need more terms, you may add them (but will lose points). Maps are repeated. Be sure to label the inputs and the outputs.



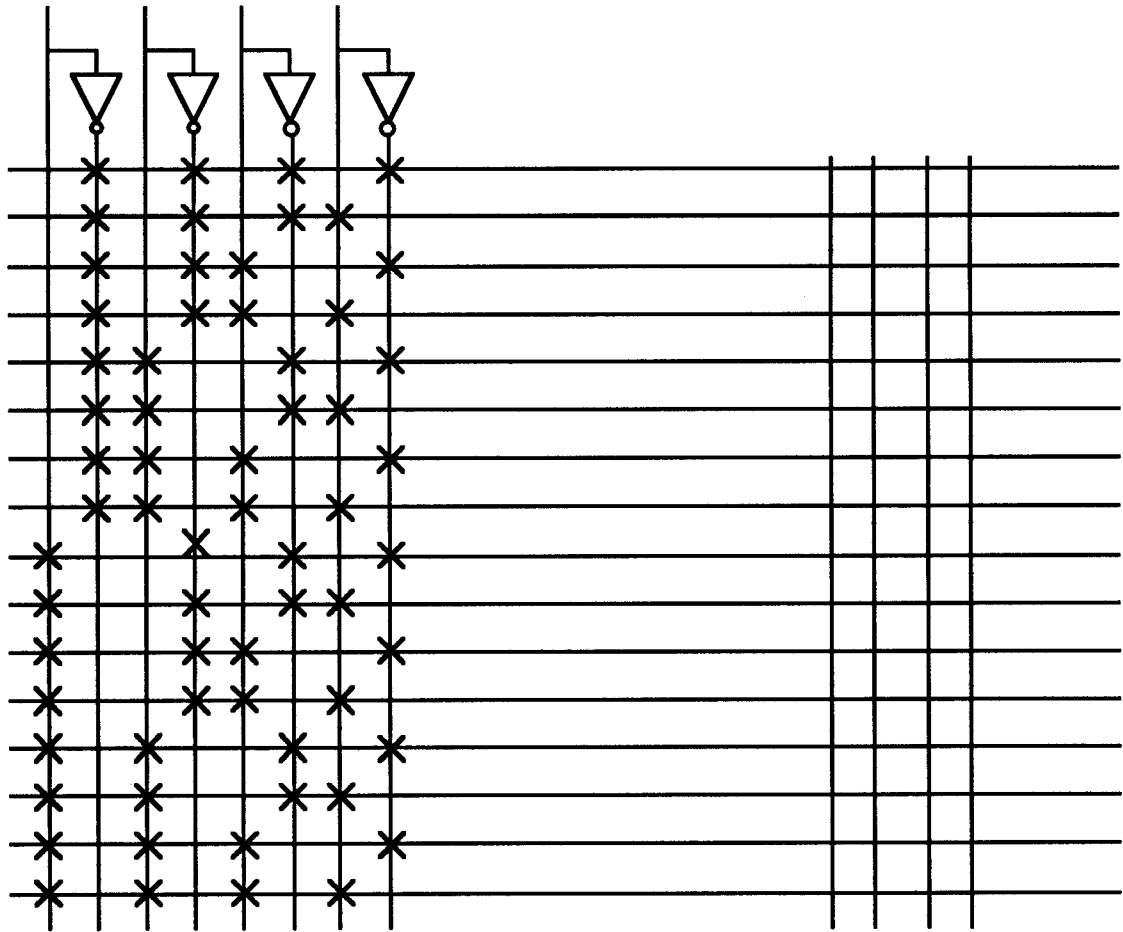
2. THE SAME FUNCTIONS ARE USED THROUGHOUT PROBLEM 2.

a) (20) For the following two functions, find a minimum two-level NAND (sum of products) solution (7 gates, 19 inputs). All inputs are available both uncomplemented and complemented. Show the equations, and a block diagram.

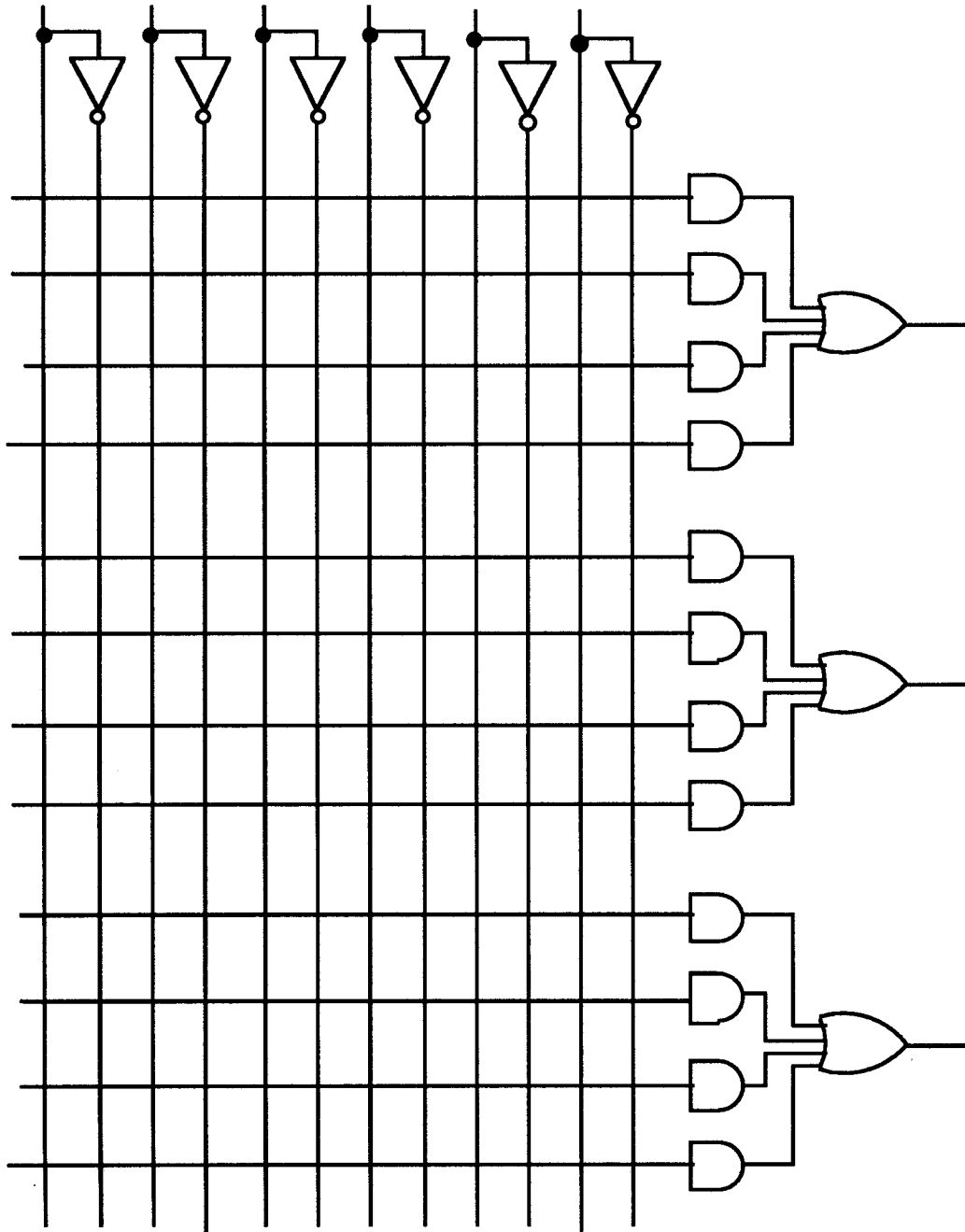
		a b			
	c d	00	01	11	10
00					1
01			1	1	
11			1	1	
10			1	1	1
		f			

		a b			
	c d	00	01	11	10
00		1	1	1	1
01			1	1	
11		1			1
10					
		g			

b) (10) Implement it on the ROM shown below. Be sure to label the inputs and the outputs.



c) (10) Implement it with the PAL shown. Be sure to label the inputs and the outputs. (You do not need to use all of the PAL.)



d) (10) Implement it with two active high decoders and two OR gates. The decoders have one active high enable (EN1) and one active low enable (EN2'). Be sure to label the inputs and the outputs.

