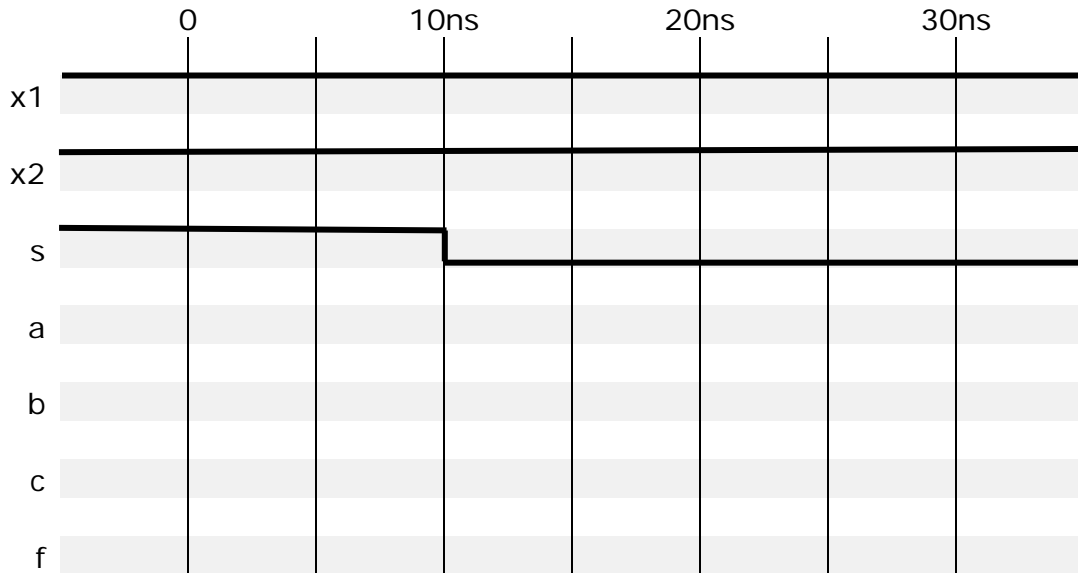
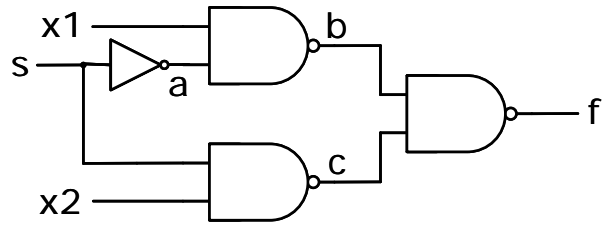


BEE 271 Spring 2017
Homework 2

Please answer the following questions. Each is worth 10 points.

- Referring to this circuit, fill in the timing diagram below, showing what happens to signals a, b, c and f. Assume all gate delays are 5 ns. You may not assume anything about the input signals prior to what's shown, so please indicate by crosshatching any signals that are unknown.



- Prove the combining theorem using a Venn diagram.

14a. $x \bullet y + x \bullet y' = x$

- What is an implicant? What is the difference between an implicant, a prime implicant and an essential prime implicant?

4. For the function f defined by this Karnaugh map, write the minterm equation $f = \Sigma m(\dots)$, identify the prime implicants and any essential prime implicants and then write the simplified SOP equation.

f			b1 b0			
			00	01	11	10
b3 b2	00	1		1	1	
	01					
	11		1			
	10	1	1	1	1	

5. For the function g defined by this Karnaugh map, write the minterm equation $g = \Sigma m(\dots)$, identify the prime implicants and any essential prime implicants and then write the simplified SOP equation.

g			b1 b0			
			00	01	11	10
b3 b2	00		1	d		
	01		d	1		
	11			d	d	
	10	1	1			

6. For the function h defined by this Karnaugh map, write the Maxterm equation $h = \Pi M(\dots)$, identify the prime implicants and any essential prime implicants and then write the simplified POS equation.

h			b1 b0			
			00	01	11	10
b3 b2	00	0			0	
	01					
	11	d				
	10	0	0	d	d	

7. For the function j defined by this Karnaugh map, write the Maxterm equation $j = \Pi M(\dots)$, identify the prime implicants and any essential prime implicants and then write the simplified POS equation.

j			$b_1 b_0$			
			00	01	11	10
$b_3 b_2$	00	0		0	0	
	01					
	11		0			
	10	0	d	0	0	

8. Use a Karnaugh map to find the simplest SOP equation for $f(a, b, c) = \Sigma m(1, 3, 5)$.
9. Use algebraic manipulation to derive the simplest SOP equation for $f(a, b, c) = \Sigma m(1, 3, 5)$, starting from the canonical SOP equation. (Hint: Does your Karnaugh map help you?)
10. Use a Karnaugh map to find the simplest POS equation for $f(a, b, c, d) = \Pi M(5, 15) + D(7, 13)$.