

# Homework 1 CSCE 312

Name: Gustavo Estrela de Matos

10.

a) OR b) AND c) NOT

13.

a)  $1 \text{ AND } (1 \text{ OR } 0) \text{ AND } 1 \Rightarrow 1$

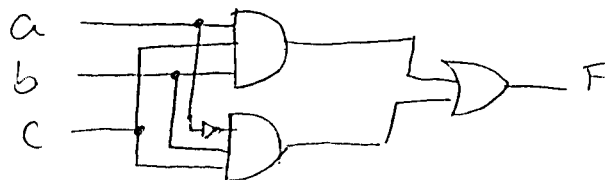
b)  $0 \text{ AND } (0 \text{ OR } 0) \text{ AND } 1 \Rightarrow 0$

c)  $1 \text{ AND } (0 \text{ OR } 0) \text{ AND } 0 \Rightarrow 0$

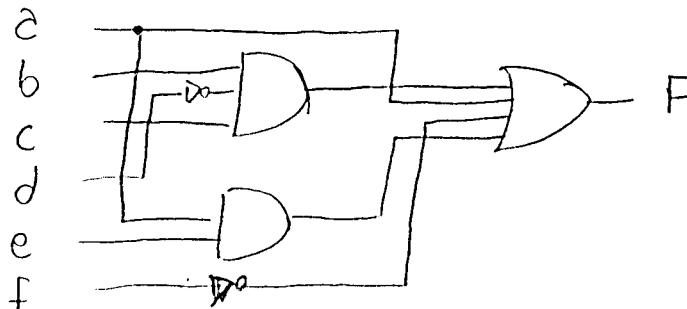
d)  $1 \text{ AND } (0 \text{ OR } 1) \text{ AND } 1 \Rightarrow 1$

19.

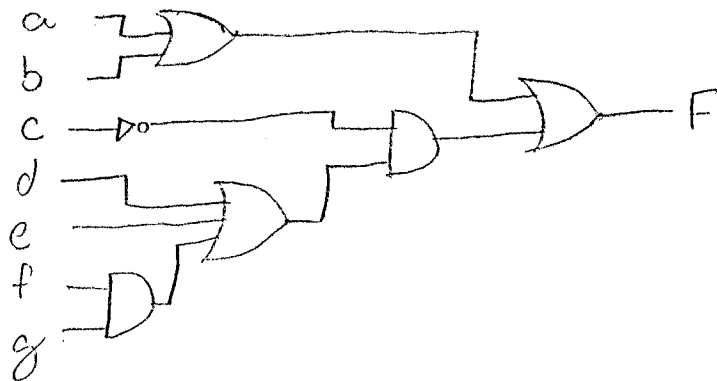
a)  $F = abc + \bar{a}bc$



b)  $F = e + bcd + ce + f$



$$c) F = (a+b) + (\bar{c} * (d+e+fg))$$



$$22. F = M + L$$

25.

$$a) f = (T * \bar{H}) + (\bar{T} * H)$$

$$b) f = \overline{(T * H) + (\bar{T} * H)} = \overline{(T * H)} * \overline{(\bar{T} * H)} = (\bar{T} + H) * (T + H) = \bar{T}H + HT$$

$$c) f = (T * F) + (T * \bar{F}) = T(F + \bar{F}) = T$$

$$d) f = \overline{\bar{T}\bar{F} + H} = (\bar{T}\bar{F}) * H = (T + F) * H = HT + HF$$

$$e) f = T * (HT + HF)$$

$$27. F = a(b+c)d + a\bar{c}(b+d) = abd + acd + a\bar{c}b + a\bar{c}d$$

$$29. \bar{F} = \overline{abc + \bar{a}b} = \overline{abc} * \overline{\bar{a}b} = (\bar{a} + \bar{b} + \bar{c}) * (a + \bar{b}) \\ = \bar{a}b + a\bar{b} + \bar{b} + a\bar{c} + \bar{b}\bar{c}$$

$$32. F = \overline{a\bar{b} + b}$$

$$37. F = (a+b+c) * (\bar{a} + \bar{b} + c)$$

$$39. F = \bar{a}b\bar{c} + \bar{a}b\bar{c} + a\bar{b}\bar{c} + a\bar{b}c + ab\bar{c}$$

$$\begin{aligned}
 40. \quad F &= \bar{a}b\bar{c} + \bar{a}b\bar{c} + a\bar{b}\bar{c} + a\bar{b}c + a\bar{b}\bar{c} \\
 &= \bar{a}\bar{c}(\bar{b}+b) + a(\bar{b}\bar{c} + \bar{b}c + b\bar{c}) \\
 &= \bar{a}\bar{c} + a(\bar{b}(c+\bar{c}) + \bar{c}(b+\bar{b})) \\
 &= \bar{a}\bar{c} + a(\bar{b} + \bar{c}) = \bar{a}\bar{c} + a\bar{b}
 \end{aligned}$$

43.

a	b	F
0	0	1
0	1	0
1	0	0
1	1	0

SL.

$$\text{circuit} = \bar{a}b + \bar{b}c$$

$$G = ab(c + \bar{c}) + \bar{b}c(\bar{a} + a) = \bar{a}b + \bar{b}c$$

They are equivalent

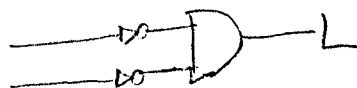
59.

Since we are using 3 bits to represent the level of gas, there are 8 possible levels of gas.

The two ones we are interested in are 000 and

001.

$$L = a_0\bar{a}_1\bar{a}_2 + \bar{a}_0\bar{a}_1\bar{a}_2 = \bar{a}_1\bar{a}_2$$



$$\begin{aligned}
 65. \quad F &= \bar{a}b + \bar{a}\bar{b} + c\bar{d} + \bar{c}d + ac \\
 &= a \oplus b + c \oplus d + ac
 \end{aligned}$$

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 40. \quad F &= \bar{a}b\bar{c} + \bar{a}b\bar{c} + a\bar{b}\bar{c} + a\bar{b}c + a.b\bar{c} \\
 &= \bar{a}\bar{c}(\bar{b}+b) + a(\bar{b}\bar{c} + \bar{b}c + b\bar{c}) \\
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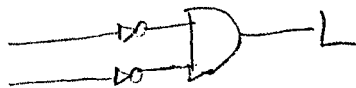
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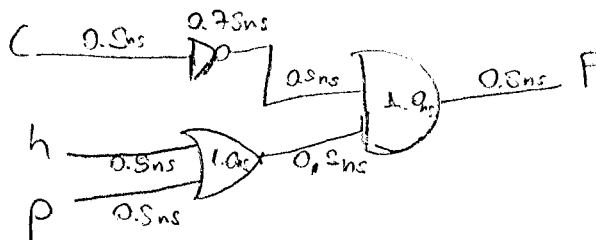


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 &= a \oplus b + c \oplus d + ac
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77

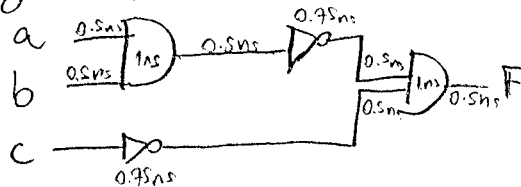
AND, OR 1 ns  
 NOT 0.75 ns  
 wire 0.5 ns

a) Figure 2.37



There are two critical paths, the one from h to F and from p to F.

b) Figure 2.41



There are, again, two critical paths, from a to F and from b to F.