SEL0414 - Sistemas Digitais
Resolução Lista 3 - Álgebra de Boole

# 01

$X = \overline{A\overline{B}\overline{C}} = \overline{A}\overline{B} + \overline{\overline{C}} = \overline{A} + \overline{B} + C$

# 02

(Lembre-se que $\overline{\overline{A}} = A$)

**a.**

$\overline{\overline{A}B\overline{C}} = A + \overline{B\overline{C}} = A + \overline{B} + C$

**b.**

$\overline{\overline{A} + \overline{B}C} = A\overline{\overline{B}C} = A(B + \overline{C})$

**c.**

$\overline{A\overline{B}\overline{C}\overline{D}} = \overline{A}\overline{B} + CD = \overline{A} + \overline{B} + CD$

**d.**

$\overline{A + \overline{B}} = \overline{A}B$

**e.**

$\overline{\overline{A}\overline{B}} = AB$

**f.**

$\overline{\overline{A} + \overline{C} + \overline{D}} = A\overline{(\overline{C} + \overline{D})} = ACD$

**g.**

$\overline{A\overline{(B + \overline{C})}D} = \overline{A} + (B + \overline{C}) + \overline{D} = \overline{A} + B + \overline{C} + \overline{D}$

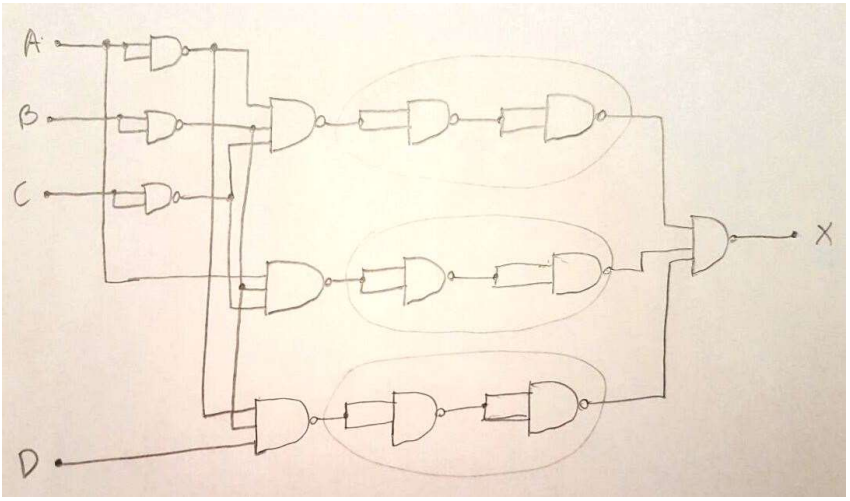
**h.**

$\overline{(M + \overline{N})(\overline{M} + N)} = \overline{M + \overline{N}} + \overline{\overline{M} + N} = \overline{M}N + M\overline{N} = M \oplus N$

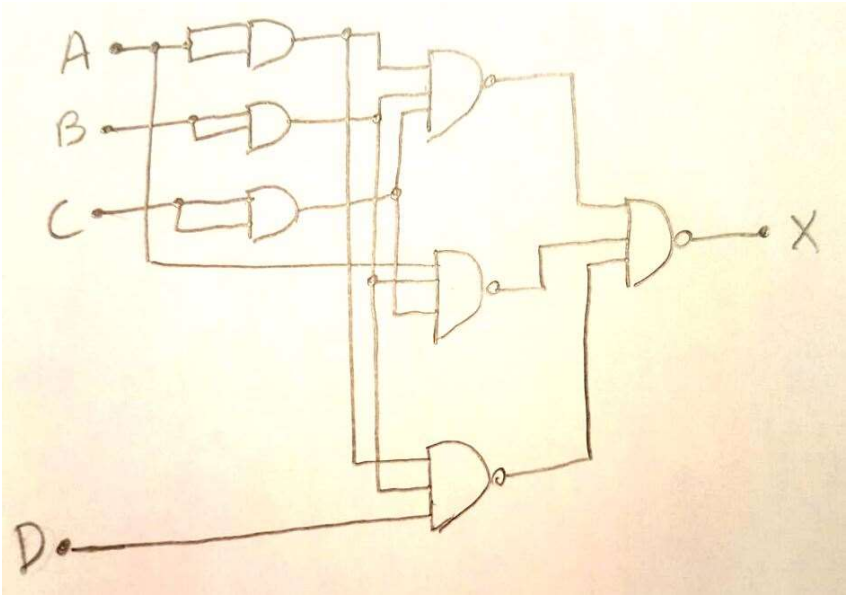
**i.**

$\overline{\overline{\overline{A}\overline{B}\overline{C}}D} = \overline{\overline{A}\overline{B}C} + \overline{D} = (\overline{A} + \overline{B})C + \overline{D}$

## 03




Podemos ainda simplificar o circuito eliminando as portas NAND circuladas, uma vez que fazem um processo de dupla inversão redundante.

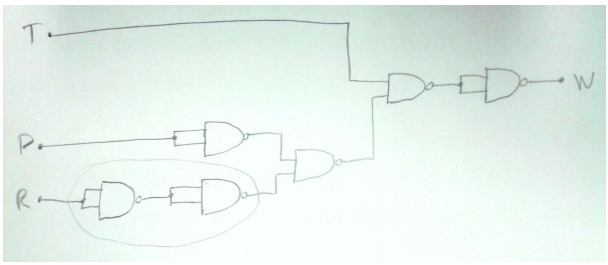



## 04

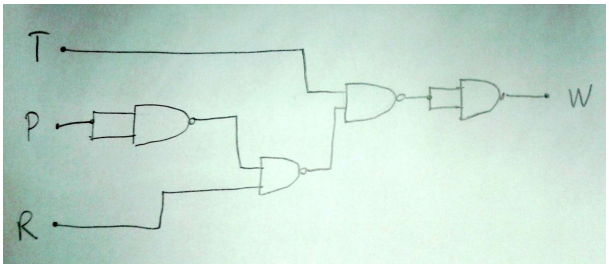
### i.

A luz de advertência será ativada quando a temperatura for maior que $93,3^{o}C$ e pelo menos um desses dois estados aconteça: a pressão for maior que $1,33N/m^2$ ou a velocidade ser menor que $4800rpm$.

### ii.




Eliminando a dupla inversão redundante:




## 05

### a.

$X = ABC + \overline{A}C = C(AB + \overline{A}) = C(\overline{A} + B) = \overline{A}C + BC$

### b.

$Y = (Q + R)(\overline{Q} + \overline{R}) = Q\overline{Q} + R\overline{Q} + R\overline{R} + Q\overline{R} = R\overline{Q} + Q\overline{R} = R \oplus Q$

### c.

$W = ABC + A\overline{B}C + \overline{A} = AC(B + \overline{B}) + \overline{A} = AC + \overline{A} = \overline{A} + C$

### d.

$Q = \overline{RST}(\overline{R + S + T}) = (\overline{R}+\overline{S}+\overline{T})\overline{R}\,\overline{S}\,\overline{T} = \overline{R}\,\overline{R}\,\overline{S}\,\overline{T}+\overline{S}\,\overline{R}\,\overline{S}\,\overline{T}+\overline{T}\,\overline{R}\,\overline{S}\,\overline{T} = \overline{R}\,\overline{S}\,\overline{T}+\overline{R}\,\overline{S}\,\overline{T}+\overline{R}\,\overline{S}\,\overline{T} = \overline{R}\,\overline{S}\,\overline{T}$

### e.

$X = \overline{A}\,\overline{B}\,\overline{C} + \overline{A}BC + ABC + A\overline{B}\,\overline{C} + A\overline{B}C = \overline{A}\,\overline{B}\,\overline{C} + BC(A+\overline{A}) + A\overline{B}(C+\overline{C}) = \overline{A}\,\overline{B}\,\overline{C} + BC + A\overline{B} = BC + \overline{B}(A + \overline{A}\,\overline{C}) = BC + \overline{B}(A + \overline{C}) = BC + \overline{B}A + \overline{B}\,\overline{C} = A\overline{B} + \overline{B \oplus C}$

### f.

$Z = (B+\overline{C})(\overline{B}+C)+\overline{\overline{A} + B + \overline{C}} = B\overline{B}+BC+\overline{B}\,\overline{C}+C\overline{C}+A\overline{B}C = \overline{B}(\overline{C}+AC)+BC = \overline{B}\,\overline{C}+\overline{B}A+BC = \overline{B \oplus C} + A\overline{B}$

### g.

$Y = \overline{C + D}+\overline{A}C\overline{D}+A\overline{B}\,\overline{C}+\overline{A}\,\overline{B}CD+AC\overline{D} = \overline{C}\,\overline{D}+C\overline{D}(A+\overline{A})+A\overline{B}\,\overline{C}+\overline{A}\,\overline{B}CD = \overline{C}\,\overline{D}+C\overline{D}+A\overline{B}\,\overline{C}+\overline{A}\,\overline{B}CD = \overline{D}(C + \overline{C}) + A\overline{B}\,\overline{C} + \overline{A}\,\overline{B}CD = \overline{D} + A\overline{B}\,\overline{C} + \overline{A}\,\overline{B}CD = \overline{D} + \overline{A}\,\overline{B}C + A\overline{B}\,\overline{C} = \overline{D} + \overline{B}(A \oplus C)$

**h.**

$X = AB\overline{\overline{C}D} + \underline{\overline{A}BD} + \underline{\overline{B}\,\overline{C}\,\overline{D}} = AB(C + \overline{D}) + \overline{A}BD \underline{+ \overline{B}\,\overline{C}\,\overline{D}} = ABC + AB\overline{D} + \overline{A}BD + \overline{B}\,\overline{C}\,\overline{D} = ABC + A(BD + \overline{B}D) + \overline{B}\,\overline{C}\,\overline{D} = ABC + A(B \oplus D) + \overline{B}\,\overline{C}\,\overline{D}$

## 06

$$A\overline{\overline{A}\overline{C}}\overline{B} + ABC = A\bar{B}(A + C) + ABC = AA\bar{B} + A\bar{B}C + ABC = A\bar{B} + A\bar{B}C + ABC$$
$$= A\bar{B} + AC(B + \bar{B}) = A\bar{B} + AC = A(\bar{B} + C)$$