

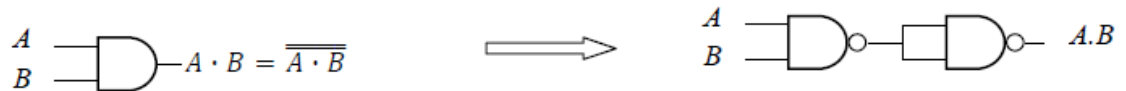
EXERCICE 1

a) Avec des portes NAND

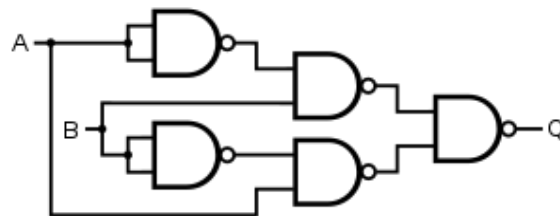
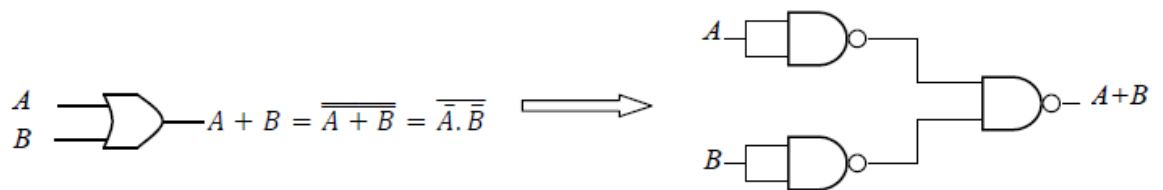
Inverseur



AND



OR



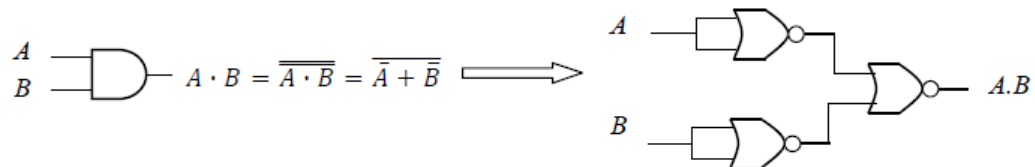
XOR

b) avec des portes NOR

Inverseur



AND



OR



Voir le TP AUSSI

EXERCICE 2

1)

a.

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

b.

A	B	S
0	0	0
0	1	0
1	0	0
1	1	1

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

c. La fonction logique réalisée est : le ET logique (AND), son symbole est :



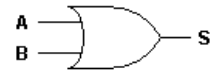
2)

$$S = \overline{\overline{A} \cdot \overline{B}}$$

A	B	S
0	0	0
0	1	1
1	0	1
1	1	1

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

La fonction logique réalisée est : le OU logique (OR), son symbole est :



3)

$$S = \overline{\overline{\overline{A} \cdot \overline{B}} \cdot \overline{\overline{B} \cdot \overline{A}}}$$

A	B	S
0	0	0
0	1	1
1	0	1
1	1	0

$$S = \overline{\overline{\overline{A} \cdot \overline{B}} \cdot \overline{\overline{B} \cdot \overline{A}}} = A \cdot \overline{B} + \overline{A} \cdot B = A \oplus B$$

La fonction logique réalisée est : le OU exclusif (XOR), son symbole est :

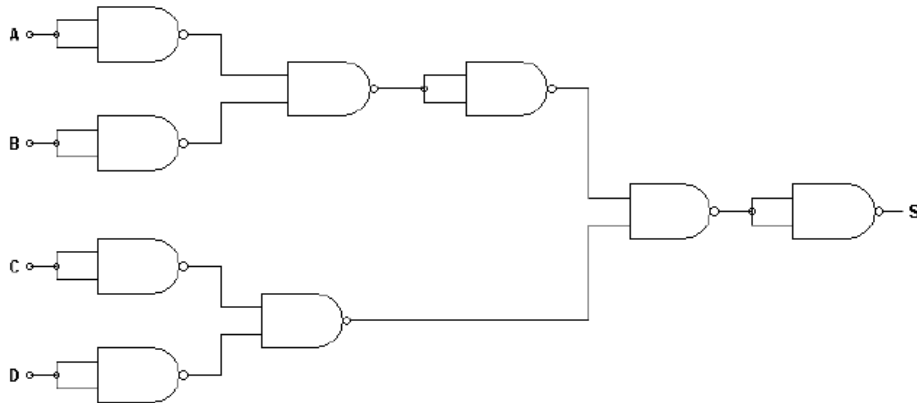


EXERCICE 3

1.

$$S = \overline{A+B} \cdot \overline{C} \cdot \overline{D}$$

2.



EXERCICE 4

1-

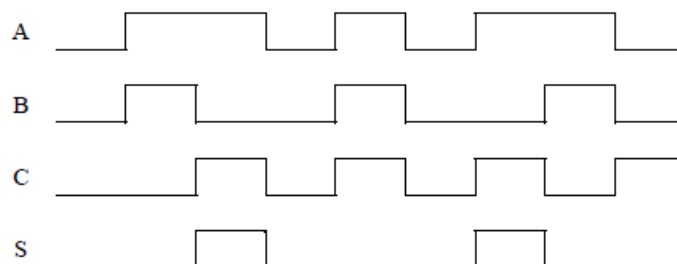
C	B	A	S
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	0

2. $S = A \cdot \bar{B} \cdot C + \bar{A} \cdot B \cdot C = \sum \Pi \text{ mintermes}$

$$S = (A+B+C)(\bar{A}+\bar{B}+C)(A+\bar{B}+C)(\bar{A}+\bar{B}+C)(A+B+\bar{C})(\bar{A}+\bar{B}+\bar{C}) = \prod \Sigma \text{ maxtermes}$$

$$S = C \cdot (A \cdot \bar{B} + A \cdot B) = C \cdot (A \oplus B)$$

3.



EXERCICE 5

1-

$$ab + \bar{b}c + ac$$

$$ab + \bar{b}c + ac(b + \bar{b}) = ab + \bar{b}c + acb + ac\bar{b} = ab(1+c) + \bar{b}c(1+a) = ab + \bar{b}c$$

2- $A + A \cdot B = A(1+B) = A$, $A + \bar{A} \cdot B = (A + \bar{A}) \cdot (A+B) = 1 \cdot (A+B) = A+B$,

EXERCICE 6

$$\begin{aligned}\overline{A} (A + \overline{B}) (\overline{A} + B) &= \overline{A} (\overline{A} + B) (A + \overline{B}) \\ &= \overline{A} (A + \overline{B}) \\ &= \overline{A} \overline{B}\end{aligned}$$

$$\begin{aligned}(B + A \cdot B + C) \cdot (A + \overline{B} + \overline{A} \cdot \overline{C}) &= (B + C) \cdot (A + \overline{B} + \overline{C}) \\ &= AB + B \overline{C} + AC + \overline{B} C \\ &= AB + B \overline{C} + A \overline{B} C + ABC + \overline{B} C \\ &= A B + B \overline{C} + \overline{B} C\end{aligned}$$

$$\begin{aligned}AB + ACD + \overline{B}D &= AB + ACD(\underbrace{B + \overline{B}}_{=1}) + \overline{B}D = AB + ABCD + A\overline{B}CD + \overline{B}D \\ &= AB(\underbrace{1 + CD}_{=1}) + \overline{B}D(\underbrace{1 + AC}_{=1}) = AB + \overline{B}D\end{aligned}$$

$$\begin{aligned}(\overline{A} + B)(A + C)(B + C) &= (\overline{A} + B)(A + C)(B + C + \underbrace{\overline{A}A}_{=0}) = (\overline{A} + B)(A + C)(B + C + \overline{A})(B + C + A) \\ &= (\overline{A} + B + \underbrace{0 \cdot C}_{=0})(A + C + \underbrace{0 \cdot B}_{=0}) = (\overline{A} + B)(A + C)\end{aligned}$$

$$\begin{aligned}AB + \overline{B}C &= AB(\underbrace{1 + C}_{=1}) + \overline{B}C(\underbrace{1 + A}_{=1}) = AB + \overline{B}C + ABC + A\overline{B}C = AB + \overline{B}C + AC \\ &= AB + \underbrace{\overline{B}B}_{=0} + \overline{B}C + AC = (A + \overline{B})B + (A + \overline{B})C = (A + \overline{B})(B + C)\end{aligned}$$

$$\overline{A\overline{B}} + \overline{\overline{A}B} = \overline{A\overline{B}} \cdot \overline{\overline{A}B} = (\overline{A} + B)(A + \overline{B}) = \underbrace{\overline{A}A}_{=0} + \overline{A}\overline{B} + BA + \underbrace{B\overline{B}}_{=0} = AB + \overline{A}\overline{B}$$

$$\begin{aligned}\overline{(A + B)(\overline{A} + C)} &= \overline{A + B} + \overline{\overline{A} + C} = (\overline{A} \cdot \overline{B}) + (A \cdot \overline{C}) = \underbrace{(\overline{A} + A)}_{=1} (\overline{A} + \overline{C}) (\overline{B} + A) (\overline{B} + \overline{C}) \\ &= (\overline{A} + \overline{C})(A + \overline{B})(\underbrace{\overline{A}A}_{=0} + \overline{B} + \overline{C}) = (\overline{A} + \overline{C})(A + \overline{B})(\overline{A} + \overline{B} + \overline{C})(A + \overline{B} + \overline{C}) \\ &= (\overline{A} + \underbrace{0 \cdot \overline{B}}_{=0} + \overline{C})(A + \overline{B} + \underbrace{0 \cdot \overline{C}}_{=0}) = (A + \overline{B})(\overline{A} + \overline{C})\end{aligned}$$