Sistemas Digitais

Funções binárias e álgebra de Boole – soluções

1. (a) $(A\ (1+B)+\overline{B})(A+\overline{B})\ \overline{A}\ B =$
$(A+\overline{B})\ (A+\overline{B})\ \overline{A}\ B =$
$(A+\overline{B})\ \overline{A}\ B =$
$A\ \overline{A}\ B+\overline{B}\ \overline{A}\ B =$
$0+0=0$

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

2. (a) $\overline{\overline{A+A\ \overline{B}+C\ D}} =$
$\overline{A\ (1+\overline{B})+C\ D} =$
$\overline{A+C\ D} =$
$\overline{A}\ (\overline{C}+\overline{D})$

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

   (c) $\overline{X}\ (X+Y)+\overline{Z}+Z\ Y=$
$\overline{X}\ Y+\overline{Z}+Z\ Y=$
$\overline{X}\ Y+\overline{Z}+Y=$
$Y+\overline{Z}$

3. (a) $A\ B+\overline{A}\ B\ C\ (X+Y) =$
$A\ B+\overline{A}\ B\ C\ X+\overline{A}\ B\ C\ Y$

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

4. (a)

A	B	C	$\overline{A}\ B\ C$	$\overline{A}\ B\ \overline{C}$	$A\ C$	F_1
0	0	0	0	0	0	0
0	0	1	0	0	0	0
0	1	0	0	1	0	1
0	1	1	1	0	0	1
1	0	0	0	0	0	0
1	0	1	0	0	1	1
1	1	0	0	0	0	0
1	1	1	0	0	1	1

(b)

A	B	C	$B+\overline{C}$	$\overline{B}+C$	F_2
0	0	0	1	1	0
0	0	1	0	1	0
0	1	0	1	0	0
0	1	1	1	1	0
1	0	0	1	1	1
1	0	1	0	1	0
1	1	0	1	0	0
1	1	1	1	1	1

(c)

A	B	C	$\overline{BC}$	$B\ C$	$A+(\overline{B}\ \overline{C}+B\ C)$	F_3
0	0	0	1	0	1	0
0	0	1	1	0	1	0
0	1	0	1	0	1	0
0	1	1	0	1	1	0
1	0	0	1	0	1	0
1	0	1	1	0	1	0
1	1	0	1	0	1	0
1	1	1	0	1	1	0

5. (a) $\overline{A}\ \overline{B}\ \overline{C}+\overline{A}\ B\ C+A\ \overline{B}\ C+A\ B\ \overline{C}+A\ B\ C=$
$=\overline{A}\ \overline{B}\ \overline{C}+\overline{A}\ B\ C+A\ \overline{B}\ C+A\ B(\ \overline{C}+C)=$
$=\overline{A}\ \overline{B}\ \overline{C}+\overline{A}\ B\ C+A\ \overline{B}\ C+A\ B=$
$=\overline{A}\ \overline{B}\ \overline{C}+\overline{A}\ B\ C+A(\overline{B}\ C+B)=$
$=\overline{A}\ \overline{B}\ \overline{C}+\overline{A}\ B\ C+A(C+B)=$
$=\overline{A}\ \overline{B}\ \overline{C}+\overline{A}\ B\ C+AC+AB=$
$=\overline{A}\ \overline{B}\ \overline{C}+B(\overline{A}\ C+A)+AC=$
$=\overline{A}\ \overline{B}\ \overline{C}+B(C+A)+AC=$
$=\overline{A}\ \overline{B}\ \overline{C}+BC+AB+AC$

(b) $(A + B + \overline{C})\ (A + \overline{B} + C)\ (\overline{A} + B + C)$
está na forma simplificada

(c) $\sum m(0, 3, 5, 6, 7)$
$\prod M(1, 2, 4)$