Exercícios Propostos

1) Simplifique cada expressão, utilizando a Álgebra de Boole:

a) $S = AB\bar{C} + \bar{A}\bar{B}C + ABC + \bar{A}BC + \bar{A}B\bar{C}$

b) $S = AB\bar{C}D + \bar{A}\bar{B}C\bar{D} + AB\bar{C}\bar{D} + \bar{A}BC\bar{D} + ABC\bar{D} + A\bar{B}C\bar{D} + ABCD$

2) Simplifique utilizando a Álgebra de Boole:

$$S = \overline{[(\bar{B} + \bar{C} + \bar{D})\,\overline{(\bar{A} + B + C)} + C]} + \bar{A}\bar{B}C + \bar{B}\overline{(A + C)}$$

3) Idem para a expressão:

$$S = A\overline{[\bar{B}\overline{(C + D)} + \bar{A}\overline{(B + C)}]} + C\bar{D} + A\bar{B}C + AB$$

4) Idem para a expressão:

$$S = \overline{(A \oplus B + \bar{B}C\bar{D})}\,\overline{[\bar{D} + \bar{B}C + D(\bar{A} + B]}} + \bar{A}\bar{D}$$

5) Idem para a expressão:

$$S = \overline{[(B + C\bar{D} + \bar{D} + AC)\,(A + \bar{B} + \bar{C}) + \bar{B}\overline{(C + \bar{A}BC + AC)}]}\,(A + B)$$

6) Desenhe o circuito que executa a expressão, simplificado:

$$S = \overline{(\bar{B} + \bar{D})}\,\overline{\{\bar{B} + C \odot D + \bar{A}\,\overline{[B\bar{C} + \bar{B}C + A + B\,\overline{(\bar{C} + \bar{D})}]}\}}$$

7) Simplifique com a Álgebra de Boole:

$$S = \overline{(\bar{A}B + C\bar{D} + AD)}\,\overline{\{\bar{B}[C \oplus D + \bar{A}\,\overline{(\bar{B} + \bar{C})} + A\bar{B}\bar{C}] + \bar{A}\}}$$

8) Demonstre que:

$A \odot (B \oplus C) = A \oplus (B \odot C)$

9) Através dos diagramas de Veitch-Karnaugh, determine a expressão simplificada de S_1 e S_2 da Tabela 3.26:

Tabela 3.26

A	B	S_1	S_2
0	0	1	1
0	1	0	1
1	0	1	0
1	1	1	0

10) Simplifique as expressões de S_1, S_2, S_3 e S_4 da Tabela 3.27, utilizando os mapas de Veitch-Karnaugh:

Tabela 3.27

A	B	C	S_1	S_2	S_3	S_4
0	0	0	1	1	0	0
0	0	1	0	1	1	1
0	1	0	1	1	0	1
0	1	1	1	0	0	0
1	0	0	1	1	1	1
1	0	1	1	1	1	0
1	1	0	0	1	1	1
1	1	1	1	0	0	1

11) Idem ao anterior para a Tabela 3.28:

Tabela 3.28

A	B	C	D	S_1	S_2	S_3	S_4
0	0	0	0	1	1	0	0
0	0	0	1	1	0	0	0
0	0	1	0	1	1	1	0
0	0	1	1	1	0	0	1
0	1	0	0	1	1	1	1
0	1	0	1	0	1	1	1
0	1	1	0	0	1	1	0
0	1	1	1	1	1	0	1
1	0	0	0	1	1	0	0
1	0	0	1	1	1	0	1
1	0	1	0	1	0	1	0
1	0	1	1	1	0	0	0
1	1	0	0	1	0	0	0
1	1	0	1	0	1	1	1
1	1	1	0	0	0	0	1
1	1	1	1	1	1	0	1

12) Simplifique as expressões utilizando diagramas de Veitch-Karnaugh:

a) $S = A\bar{B}\bar{C} + A\bar{B}C + \bar{A}BC + \bar{A}B\bar{C} + ABC$

b) $S = \bar{A}\bar{B}C\bar{D} + \bar{A}\bar{B}CD + \bar{A}\bar{B}\bar{C}\bar{D} + AB\bar{C}D + \bar{A}BCD + A\bar{B}\bar{C}D + ABCD + A\bar{B}\bar{C}\bar{D}$

c) $S = \bar{B}\bar{D} + \bar{A} + A\bar{B}\bar{C}D + A\bar{B}CD + \bar{A}\bar{C}$

d) $S = ABC + AB + \bar{A}BCD + BD + CD + \bar{B}C\bar{D} + \bar{A}B\bar{C}\bar{D}$

13) Determine as expressões simplificadas para S_1 e S_2 da Tabela 3.29:

Tabela 3.29

A	B	C	D	E	S_1	S_2
0	0	0	0	0	1	1
0	0	0	0	1	1	0
0	0	0	1	0	1	1
0	0	0	1	1	1	0
0	0	1	0	0	0	1
0	0	1	0	1	1	1
0	0	1	1	0	0	1
0	0	1	1	1	1	1
0	1	0	0	0	0	1
0	1	0	0	1	0	0
0	1	0	1	0	1	1
0	1	0	1	1	0	0
0	1	1	0	0	1	1
0	1	1	0	1	1	1
0	1	1	1	0	0	1
0	1	1	1	1	1	1
1	0	0	0	0	1	1
1	0	0	0	1	1	0
1	0	0	1	0	0	1
1	0	0	1	1	0	1
1	0	1	0	0	0	1
1	0	1	0	1	1	1
1	0	1	1	0	0	1

A	B	C	D	E	S_1	S_2
1	0	1	1	1	1	1
1	1	0	0	0	0	1
1	1	0	0	1	0	0
1	1	0	1	0	1	1
1	1	0	1	1	0	0
1	1	1	0	0	0	1
1	1	1	0	1	1	1
1	1	1	1	0	0	1
1	1	1	1	1	1	1

14) Simplifique as expressões de S_1 e S_2 da Tabela 3.30:

Tabela 3.30

A	B	C	S_1	S_2
0	0	0	X	1
0	0	1	0	X
0	1	0	1	0
0	1	1	X	0
1	0	0	1	0
1	0	1	X	1
1	1	0	X	X
1	1	1	1	X

15) Determine as expressões simplificadas de S_1, S_2, S_3 e S_4 da Tabela 3.31:

Tabela 3.31

A	B	C	D	S_1	S_2	S_3	S_4
0	0	0	0	1	X	0	X
0	0	0	1	X	X	0	0
0	0	1	0	X	1	0	X
0	0	1	1	X	0	1	1
0	1	0	0	1	X	X	1
0	1	0	1	0	1	X	X
0	1	1	0	X	0	1	0
0	1	1	1	X	1	0	1
1	0	0	0	X	1	X	0
1	0	0	1	1	0	1	1
1	0	1	0	X	X	0	0
1	0	1	1	1	1	0	X
1	1	0	0	X	0	1	1
1	1	0	1	X	1	0	1
1	1	1	0	1	1	X	1
1	1	1	1	0	X	1	X

16) Desenhe os circuitos minimizados que executam as saídas S_1 e S_2 da tabela verdade:

Tabela 3.32

A	B	C	D	E	S_1	S_2
0	0	0	0	0	0	1
0	0	0	0	1	0	X
0	0	0	1	0	1	1
0	0	0	1	1	0	X
0	0	1	0	0	1	X
0	0	1	0	1	1	1
0	0	1	1	0	0	X
0	0	1	1	1	1	1
0	1	0	0	0	0	1
0	1	0	0	1	0	0
0	1	0	1	0	1	1
0	1	0	1	1	0	0
0	1	1	0	0	1	X
0	1	1	0	1	1	1
0	1	1	1	0	0	0
0	1	1	1	1	1	1
1	0	0	0	0	0	1
1	0	0	0	1	0	X
1	0	0	1	0	1	1
1	0	0	1	1	0	0
1	0	1	0	0	1	X
1	0	1	0	1	1	1

A	B	C	D	E	S_1	S_2
1	0	1	1	0	0	0
1	0	1	1	1	1	1
1	1	0	0	0	0	X
1	1	0	0	1	0	1
1	1	0	1	0	1	1
1	1	0	1	1	0	1
1	1	1	0	0	1	1
1	1	1	0	1	1	X
1	1	1	1	0	0	1
1	1	1	1	1	1	X

17) Obtenha a expressão simplificada:

$$S = (\bar{\bar{A}} + B)\,\{\bar{B} + (B \oplus C)\,[\bar{A}B\bar{C} + B\,\overline{(A + \bar{\bar{D}})} + B\bar{C} + \bar{B}D] + ABD\}$$

18) Prove que:

$$\overline{A \oplus B \oplus C \oplus D} = A \odot B \odot C \odot D$$