

BT3 Technology 2020 1 Solution

Exercise 1 Solution

Deduce the simplified logic function represented by the following Karnaugh diagram:

(4 pts)

	AB	00	01	11	10
CD					
00		1	0	1	1
01		0	1	1	0
11		1	1	1	1
10		1	0	1	1

	AB	00	01	11	10
CD					
00		1	0	1	1
01		0	1	1	0
11		1	1	1	1
10		1	0	1	1

Simplified: $D'B' + AB + CD + DB$

Exercise 2 Solution

Using Boole algebra reduce the following logical functions:

$$F1 = \bar{A} + AB + \bar{B}\bar{C} + \bar{A}C + B\bar{C}D + \bar{A}D + \bar{B}D + A\bar{C}\bar{D}$$

$$\bar{A} + AB + \bar{B}\bar{C} + B\bar{C}D + \bar{A}D + \bar{B}D + A\bar{C}\bar{D}$$

$$\bar{A} + AB + \bar{B}\bar{C} + B\bar{C}D + \bar{B}D + A\bar{C}\bar{D}$$

$$\bar{A} + B + \bar{B}\bar{C} + B\bar{C}D + \bar{B}D + A\bar{C}\bar{D}$$

$$\bar{A} + B + \bar{B}\bar{C} + B\bar{C}D + \bar{B}D + \bar{C}\bar{D}$$

$$\bar{A} + B + \bar{B}\bar{C} + \bar{B}D + \bar{C}\bar{D}$$

$$\bar{A} + B + \bar{C} + \bar{B}D + \bar{C}\bar{D}$$

$$\bar{A} + B + \bar{C} + D + \bar{C}\bar{D}$$

$$\bar{A} + B + \bar{C} + D$$

$$F2 = \bar{A}\bar{B}C + \bar{A}B\bar{C} + A\bar{B}C + AB\bar{C}$$

$$A'B'C + A'B'C + AB'C + ABC'$$

$$A'B'C + AB'C + ABC'$$

$$B'C(A'+A) + ABC'$$

$$B'C(1) + ABC'$$

$$B'C + ABC'$$

Exercise 3 Solution

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

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

Exercise 4 Solution

Create a logic circuit that performs the following actions:

(9 pts)

- A 3-digit binary number will be applied to the circuit entry.
 - The circuit has one output bit.
 - If the number applied to the input has a single bit 0 the circuit provides 0 as an output if not the circuit provides 1.
- a) Build the truth table.

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

b) Simplify the output function of this circuit.

$$S = A'B'C' + A'B'C + A'BC' + AB'C' + ABC$$

$$A'B'(C+C') + A'BC' + AB'C' + ABC$$

$$A'B'(1) + A'BC' + AB'C' + ABC$$

$$A'B' + A'BC' + AB'C' + ABC$$

$$B'(A'+AC') + A'BC' + ABC$$

$$B'(A'+C') + A'BC' + ABC$$

$$B'A' + B'C' + A'BC' + ABC$$

$$A'(B'+BC') + B'C' + ABC$$

$$A'(B'+C') + B'C' + ABC$$

$$A'B' + A'C' + B'C' + ABC$$

METHOD 2

A \ BC	00	01	11	10
0	1	1		1
1	1		1	

$$ABC + A'C' + A'B' + B'C'$$

c) Draw the circuit of the simplified function.

