FUNCȚII BOOLEENE ELEMENTARE – VERIFICĂRI

x_1	x_2	f_0	f_1	f_2	f_3	f_4	f_5	f_6	f_7	f_8	f_9	f_{10}	f_{11}	f_{12}	f_{13}	f_{14}	f_{15}
0	0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
0	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
1	0	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

- Funcțiile *identitate* f_{10} și f_{12} corespund valorilor argumentelor:

  $f_{10}(x_1, x_2) = x_2$, $f_{12}\,(x_1, x_2) = x_1$. (1.25)

  Verificare:

  $f_{10}(x_1, x_2) = \bar{x}_1 x_2 + x_1 x_2 = x_2(\bar{x}_1 + x_1) = x_2 \cdot 1 = x_2$,

  $f_{12}\,(x_1, x_2) = x_1 \bar{x}_2 + x_1 x_2 = x_1(\bar{x}_2 + x_2) = x_1 \cdot 1 = x_1$,

  $\bar{f}_{10}(x_1, x_2) = \bar{x}_1 \bar{x}_2 + x_1 \bar{x}_2 = \bar{x}_2(\bar{x}_1 + x_1) = \bar{x}_2 \cdot 1 = \bar{x}_2$, $f_{10}(x_1, x_2) = x_2$,

  $\bar{f}_{12}(x_1, x_2) = \bar{x}_1 \bar{x}_2 + \bar{x}_1 x_2 = \bar{x}_1(\bar{x}_2 + x_2) = \bar{x}_1 \cdot 1 = \bar{x}_1$, $f_{12}(x_1, x_2) = x_1$.

- Funcția *disjuncție* sau funcția *SAU* f_{14}:

  $f_{14}(x_1, x_2) = x_1 + x_2$. (1.28)

  Verificare:

  $$\begin{aligned} f_{14}(x_1, x_2) &= \bar{x}_1 x_2 + x_1 \bar{x}_2 + x_1 x_2 \\ &= \bar{x}_1 x_2 + x_1 \bar{x}_2 + x_1 x_2 + x_1 x_2 = (\bar{x}_1 x_2 + x_1 x_2) + (x_1 \bar{x}_2 + x_1 x_2) \\ &= x_2(\bar{x}_1 + x_1) + x_1(\bar{x}_2 + x_2) = x_1 \cdot 1 + x_2 \cdot 1 = x_1 + x_2, \end{aligned}$$

  $\bar{f}_{14}(x_1, x_2) = \bar{x}_1 \bar{x}_2$, $f_{14}(x_1, x_2) = \overline{\bar{x}_1 \bar{x}_2} = x_1 + x_2$.

- Funcția *lui Sheffer* sau funcția *ȘI-NU* (*NAND*) f_7:

  $f_7(x_1, x_2) = \overline{x_1 x_2} = \bar{x}_1 + \bar{x}_2$. (1.33)

  Verificare:

  $$\begin{aligned} f_7(x_1, x_2) &= \bar{x}_1 \bar{x}_2 + \bar{x}_1 x_2 + x_1 \bar{x}_2 = \bar{x}_1 \bar{x}_2 + \bar{x}_1 \bar{x}_2 + \bar{x}_1 x_2 + x_1 \bar{x}_2 \\ &= (\bar{x}_1 \bar{x}_2 + \bar{x}_1 x_2) + (\bar{x}_1 \bar{x}_2 + x_1 \bar{x}_2) = \bar{x}_1(\bar{x}_2 + x_2) + \bar{x}_2(\bar{x}_1 + x_1) = \bar{x}_1 \bar{x}_2, \end{aligned}$$

  $\bar{f}_7(x_1, x_2) = x_1 x_2$, $f_7(x_1, x_2) = \overline{x_1 x_2} = \bar{x}_1 + \bar{x}_2$.

- Funcția *suma modulo 2* sau funcția *SAU-EXCLUSIV* (*XOR*) f_6:

  $f_6(x_1, x_2) = \bar{x}_1 x_2 + x_1 \bar{x}_2$. (1.37)

  Verificare:

  $\bar{f}_6(x_1, x_2) = \bar{x}_1 \bar{x}_2 + x_1 x_2$,

  $$\begin{aligned} f_6(x_1, x_2) &= \overline{\bar{x}_1 \bar{x}_2 + x_1 x_2} = (x_1 + x_2)(\bar{x}_1 + \bar{x}_2) = x_1 \bar{x}_1 + x_1 \bar{x}_2 + \bar{x}_1 x_2 + x_2 \bar{x}_2 \\ &= x_1 \bar{x}_2 + \bar{x}_1 x_2. \end{aligned}$$

- Funcția *implicație inversă* f_{13}:
  $f_{13}(x_1, x_2) = x_1 + \bar{x}_2.$ (1.41)

  Verificare:
  $$f_{13}(x_1, x_2) = \bar{x}_1\bar{x}_2 + x_1\bar{x}_2 + x_1x_2 = \bar{x}_1\bar{x}_2 + x_1\bar{x}_2 + x_1x_2 + x_1\bar{x}_2$$
  $$= \bar{x}_2(\bar{x}_1 + x_1) + x_1(x_2 + \bar{x}_2) = x_1 + \bar{x}_2,$$
  $\bar{f}_{13}(x_1, x_2) = \bar{x}_1x_2$, $f_{13}(x_1, x_2) = \overline{\bar{x}_1x_2} = x_1 + \bar{x}_2.$