

Exercise 01 :

- a) Find the functions F1 and F2 presented by the following truth tables. After simplify them by using algebraic method then using KARNAUGH table method.

a	b	c	F1
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

x	y	z	t	F2
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

- b) Prove the following expressions by using the algebraic method then by using KARNAUGH table method:

$$1 - \overline{a} \overline{b} + \overline{a} \overline{b} \overline{c} + \overline{a} \overline{b} c = \overline{b}$$

$$2 - \overline{x} \overline{y} + \overline{x} \overline{y} + yz + \overline{y} \overline{z} = \overline{x} \overline{y}$$

$$3 - \overline{a} \overline{b} + \overline{a} \overline{b} + bd = \overline{b} + d$$

Exercise 02 :

- 1) Give all the four canonical forms of the functions: F1, F2 et F3 presented by the following truth table:

a	b	c	F1	F2	F3
0	0	0	0	1	1
0	0	1	1	1	1
0	1	0	0	1	0
0	1	1	1	1	1
1	0	0	0	0	1
1	0	1	1	0	1
1	1	0	1	1	0
1	1	1	1	1	0

- 2) Give the 1st then the 2nd canonical forms of each function:

$$F_1 = \overline{a}\overline{b}\overline{c} + \overline{a}b\overline{c} + \overline{a}bc + a\overline{b}\overline{c} + a\overline{b}c + abc$$

$$F_2 = \overline{a}b\overline{c} + \overline{a}bc + abc$$

$$F_3 = \overline{a} + \overline{b} + \overline{c}$$

$$F_4 = (\overline{a} + \overline{c}) + (\overline{b} + \overline{d})$$

- 3) Prove the following expressions :

$$\overline{x}yz + x\overline{y}z + xyz = (x + y + z)(x + \overline{y} + z)(\overline{x} + y + z)(\overline{x} + \overline{y} + z)(x + y + \overline{z})$$

$$\overline{a}b + ab = (a + b)(\overline{a} + \overline{b})$$

$$\overline{a}c + abc + abc = (a + c)(\overline{a} + \overline{c})$$

Exercise 03 :

Simplify by using the KARNAUGH table, after represent them by using only NAND gates then only NOR gates, the following functions.

$$F_1 = (a + b)(\overline{a}b + \overline{a}c)(\overline{a}\overline{c} + b)$$

$$F_2 = ab(a\overline{b}\overline{c} + a\overline{b}c + \overline{a}bc)$$

$$F_3 = (a + c)(b + d)$$

$$F_4 = a\overline{b}c + \overline{a}b\overline{c} + \overline{a}b\overline{c} + \overline{a}b\overline{c}$$

$$F_5 = (a + c + d)(b + c + d)$$

$$F_6 = abc + \overline{a}bc + a\overline{b}c + ab\overline{c} + \overline{a}b\overline{c} + \overline{a}b\overline{c} + a\overline{b}c$$

$$F_7 = (a\overline{b} + c + cd)(\overline{a}\overline{c} + bc + d)$$

$$F_8 = (a + b + c)(a + \overline{b} + \overline{c})(a + \overline{b} + c)(a + b + \overline{c})$$

$$F_9 = xyz + x\overline{y}z$$

$$F_{10} = ab(\overline{c}d + \overline{b}c)$$