VE270 Homework 1

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Problem 1.

$$\begin{aligned}(1101101.011)_2 &= 1\times 2^6+1\times 2^5+1\times 2^3+1\times 2^2+1\times 2^0+1\times 2^{-2}+1\times 2^{-3}\\ &= 64+32+8+4+1+0.25+0.125\\ &= (109.375)_{10}\\ (1101101.011)_2 &= (01101101.0110)_2\\ &= (6\mathrm{D}.6)_{16}\end{aligned}$$

$$\begin{aligned}(87.64)_{10} &\approx 1\times 2^6+1\times 2^4+1\times 2^2+1\times 2^1+1\times 2^0+1\times 2^{-1}+1\times 2^{-3}+1\times 2^{-7}+1\times 2^{-8}+1\times 2^{-9}\\ &= (1010111.101000111)_2\\ (87.64)_{10} &\approx (001010111.101000111)_2\\ &= (127.507)_8\\ (87.64)_{10} &\approx 1\times 3^4+2\times 3^1+1\times 3^{-1}+2\times 3^{-2}+2\times 3^{-3}+2\times 3^{-5}\\ &= (10020.12202)_3\end{aligned}$$

Problem 2.

$$\begin{array}{cccccccc} & 0 & 1 & 1 & 1 & 1 & 1 & \\ & & 6 & \mathrm{F} & \mathrm{E} & 5 & 8 & \mathrm{C} \\ + & & & & 3 & \mathrm{A} & \mathrm{D} & \mathrm{D} \\ \hline & & 7 & 0 & 2 & 0 & 6 & 9 \end{array}$$

$$(6\mathrm{FE58C}-3\mathrm{ADD})_{16} = (702069)_{16}$$

$$\begin{array}{ccccccccc} 1 & 0 & 0 & 0 & 1 & 1 & 1 & 1 & \\ & 0 & 0 & 0 & 1 & 1 & 1 & 0 & 0 \\ - & 1 & 0 & 0 & 0 & 1 & 1 & 1 & 1 \\ \hline & 1 & 0 & 0 & 0 & 1 & 1 & 0 & 1 \end{array}$$

$$(11100-10001111)_2 = (-1110011)_2$$

$$\begin{array}{cccc} & 0 & 1 & 1 \\ & & 5 & 4 & 5 \\ - & & 2 & 6 & 7 \\ \hline & & 2 & 5 & 6 \end{array}$$

$$(545-267)_8 = (256)_8$$

Problem 3.

(a)

$$1 \wedge (1 \vee 0) \wedge 1 = 1 \wedge 1 \wedge 1 = 1$$

(b)

$$0 \wedge (0 \vee 0) \wedge 1 = 0 \wedge 0 \wedge 1 = 0$$

(c)

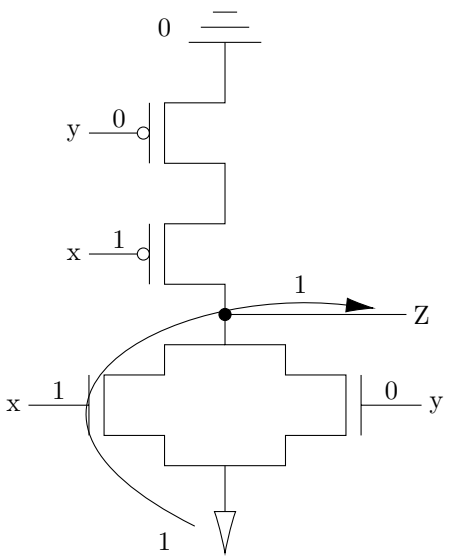
$$1 \wedge (0 \vee 0) \wedge 0 = 1 \wedge 0 \wedge 0 = 0$$

(d)

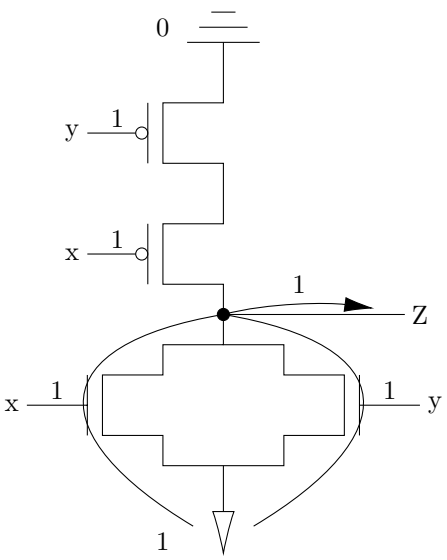
$$1 \wedge (0 \vee 1) \wedge 1 = 1 \wedge 1 \wedge 1 = 1$$

Problem 4.

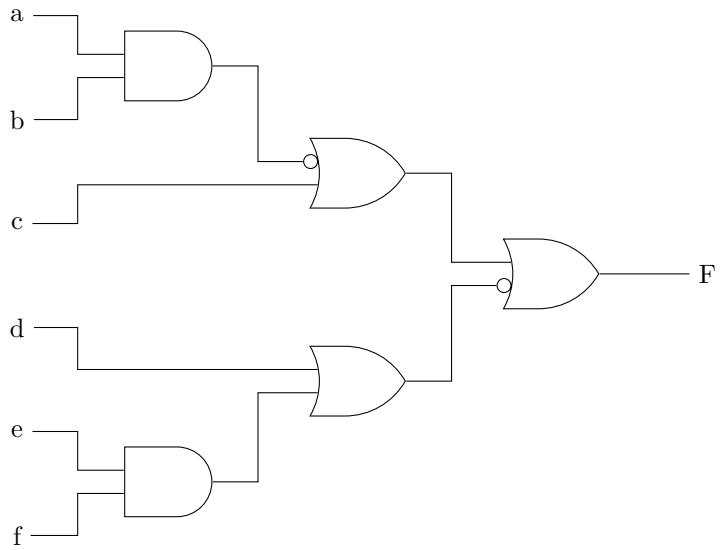
(a)



(b)

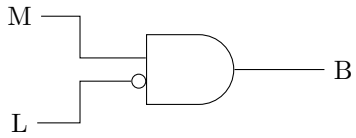


Problem 5.



Problem 6.

$$B = ML'$$



Problem 7.

$$\mathrm{G} = (\mathrm{ab}' + \mathrm{b}) + \mathrm{a}'\mathrm{c}$$

Problem 8.

(c)

a	b	c	F
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

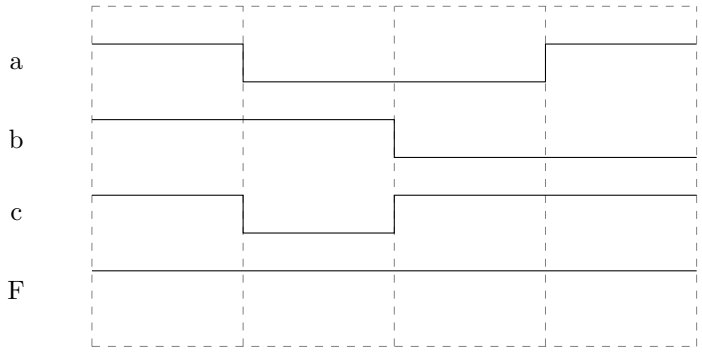
(d)

a	b	c	d	F
0	0	0	0	1
0	0	0	1	0
0	0	1	0	1
0	0	1	1	0
0	1	0	0	1
0	1	0	1	0
0	1	1	0	1
0	1	1	1	1
1	0	0	0	1
1	0	0	1	0
1	0	1	0	1
1	0	1	1	0
1	1	0	0	1
1	1	0	1	0
1	1	1	0	1
1	1	1	1	0

Problem 9.

A	B	C	F
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	0

Problem 10.



Problem 11.

Represent following numbers in 2's complement system

$$5 = (0101)_2$$

$$7 = (0111)_2$$

$$-6 = (1010)_2$$

$$-2 = (1110)_2$$

Recognize following 2's complement numbers

$$(1100)_2 = -4$$

$$(0110)_2 = 6$$

$$(0000)_2 = 0$$

$$(1000)_2 = -8$$