

VE270 Homework 1

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Problem 1.

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

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

Problem 2.

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

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

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

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

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

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

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)

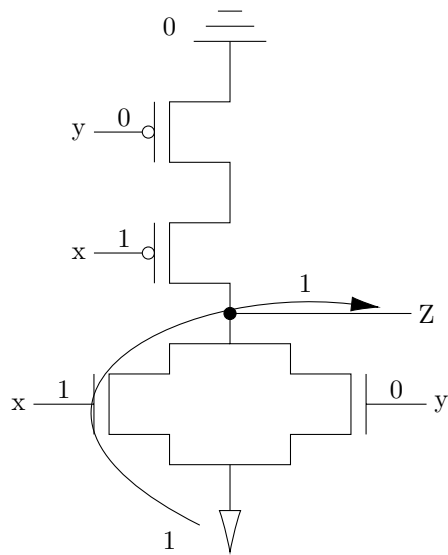
$$1 \wedge (0 \vee 0) \wedge 0 = 1 \wedge 0 \wedge 0 = 0$$

(d)

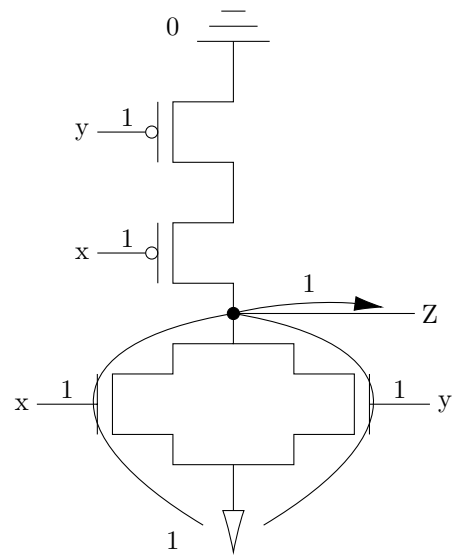
$$1 \wedge (0 \vee 1) \wedge 1 = 1 \wedge 1 \wedge 1 = 1$$

Problem 4.

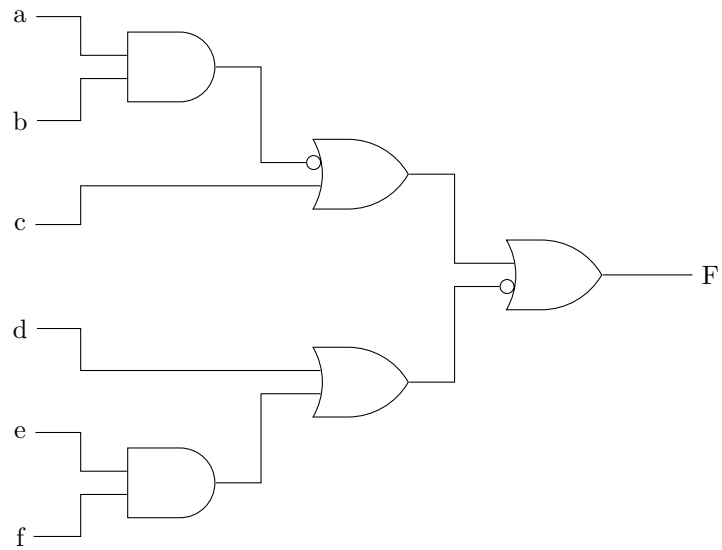
(a)



(b)

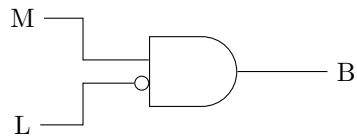


Problem 5.



Problem 6.

$$B = ML'$$



Problem 7.

$$G = (ab' + b) + a'c$$

Problem 8.

(d)

(c)

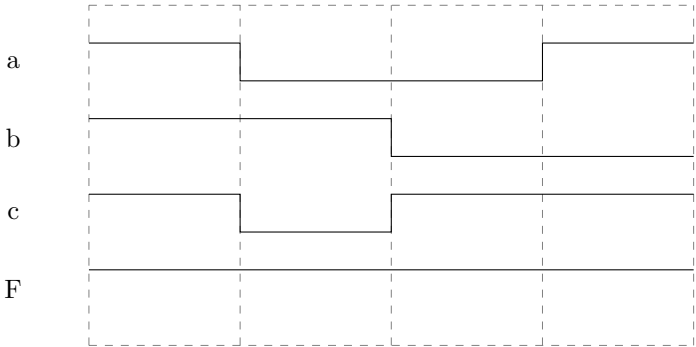
a	b	c	F
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

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

$$(1100)_2 = -4$$

$$(0110)_2 = 6$$

$$(0000)_2 = 0$$

$$(1000)_2 = -8$$