

Homework 1

Problem 1.1

Solution:

a) $10100_2 = 1 * 2^4 + 0 * 2^3 + 1 * 2^2 + 0 * 2^1 + 0 * 2^0 = 16 + 4 = \mathbf{20}$

b) $11011011_2 = 1 * 2^7 + 1 * 2^6 + 0 * 2^5 + 1 * 2^4 + 1 * 2^3 + 0 * 2^2 + 1 * 2^1 + 1 * 2^0 = 128 + 64 + 16 + 8 + 2 + 1 = \mathbf{219}$

c) $001001001_2 = 0 * 2^8 + 0 * 2^7 + 1 * 2^6 + 0 * 2^5 + 0 * 2^4 + 1 * 2^3 + 0 * 2^2 + 0 * 2^1 + 1 * 2^0 = 64 + 8 + 1 = \mathbf{73}$

d) $11111111111_2 = 1 * 2^{11} + 1 * 2^{10} + 1 * 2^9 + 1 * 2^8 + 1 * 2^7 + 1 * 2^6 + 1 * 2^5 + 1 * 2^4 + 1 * 2^3 + 1 * 2^2 + 1 * 2^1 + 1 * 2^0 = 2048 + 1024 + 512 + 256 + 128 + 64 + 32 + 16 + 8 + 4 + 2 + 1 = \mathbf{4095}$

e) $75077_8 = 7 * 8^0 + 7 * 8^1 + 0 * 8^2 + 5 * 8^3 + 7 * 8^4 = 7 + 56 + 2560 + 28672 = \mathbf{31295}$

f) $12101_3 = 1 * 3^0 + 0 * 3^1 + 1 * 3^2 + 2 * 3^3 + 1 * 3^4 = 1 + 9 + 54 + 81 = \mathbf{145}$

g) $26601_7 = 1 * 7^0 + 0 * 7^1 + 6 * 7^2 + 6 * 7^3 + 2 * 7^4 = 1 + 294 + 2058 + 4802 = \mathbf{7155}$

h) $431021_5 = 1 * 5^0 + 2 * 5^1 + 0 * 5^2 + 1 * 5^3 + 3 * 5^4 + 4 * 5^5 = 1 + 10 + 125 + 1875 + 12500 = \mathbf{14511}$

Problem 1.2

Solution:

a) $4272_{10} = 1000010110000_2$

Number	Divided by 2	Remainder
4272	2136	0
2136	1068	0
1068	534	0
534	267	0
267	133	1
133	66	1
66	33	0
33	16	1
16	8	0
8	4	0
4	2	0
2	1	0
1	0	1

b) CBA_{16}

$C_{16} = 12_{10} = 1100_2$

$B_{16} = 11_{10} = 1011_2$

$A_{16} = 10_{10} = 1010_2$

$CBA_{16} = 110010111010_2$

c) $B8C_{16}$

$$B_{16} = 11_{10}$$

$$8_{16} = 8_{10}$$

$$C_{16} = 12_{10}$$

$$B8C_{16} = 11 * 16^2 + 8 * 16^1 + 12 * 16^0 = 2816 + 128 + 12 = 2956_2$$

d) $29D816_{16}$

$$2_{16} = 2_{10}$$

$$9_{16} = 9_{10}$$

$$D_{16} = 13_{10}$$

$$8_{16} = 8_{10}$$

$$1_{16} = 1_{10}$$

$$6_{16} = 6_{10}$$

$$29D816_{16} = 2 * 16^3 + 9 * 16^2 + 13 * 16^1 + 8 * 16^0 = 8192 + 2304 + 208 + 8 = 10712_{10}$$

$$e) 8CE_{16} + 1 = 8CF_{16} + 1 = 8D0_{16} + 1 = 8D1_{16} + 1 = 8D2_{16} + 1 = 8D3_{16}$$

Problem 1.3

Solution:

a) 732_{10}

$$7_{10} = 0111_2$$

$$3_{10} = 0011_2$$

$$2_{10} = 0010_2$$

$$73210_{10} = 011100110010_{BCD}$$

b) All invalid BCD codes are:

1010, 1011, 1100, 1101, 1110 and 1111

c) 100101010110_{BCD}

$$1001_2 = 9_{10}$$

$$0101_2 = 5_{10}$$

$$0110_2 = 6_{10}$$

$$100101010110_{BCD} = 956_{10}$$

d)

$$109_{10} = 1101101_2$$

Number	Divided by 2	Remainder
109	54	1
54	27	0
27	13	1
13	6	1
6	3	0
3	1	1
1	0	1

$$0110\ 1101_2 = 6D_{16}$$

e)

$$77_{10} = 1001101_2$$

Number	Divided by 2	Remainder
77	38	1
38	19	0
19	9	1
9	4	1
4	2	0
2	1	0
1	0	1

$$0100\ 1101_2 = 4D_{16}$$

Problem 1.4**Solution:**

a) The logic function that provides a low output in response to one or more low inputs is:

(iii) AND

b) The logic function that provides a low output only when all inputs are low is:

(i) OR

Problem 1.5**Solution:**

The truth table for an AND gate with three inputs:

A	B	C	$A \wedge B \wedge C$
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

Problem 1.6**Solution:**

the truth table for an OR gate with four inputs.

A	B	C	D	$A \vee B \vee C \vee D$
0	0	0	0	0
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	0	1	1	1
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1