EE115B, Fall 2022, Homework 1

Solution

1. (1) $(17.25)_{10}$ to binary.

> For 17:

		remainder
2	17	1
2	8	0
2	4	0
2	2	0
2	1	1
	0	

$(17)_{10} = (10001)_2$

> For 0.25:

① $0.25 \times 2 = 0.5$ → 0

② $0.5 \times 2 = 1.0$ → 1

$(0.25)_{10} = (0.01)_2$

> $\boxed{(17.25)_{10} = (10001.01)_2}$

(2) $(10110.101)_2$ to decimal.

$$(10110.101)_2 = 1\times2^4 + 0\times2^3 + 1\times2^2 + 1\times2^1 + 0\times2^0 + 1\times2^{-1} + 0\times2^{-2} + 1\times2^{-3}$$

$$= 16 + 4 + 2 + 0.5 + 0.125$$

$$= \boxed{(22.625)_{10}}$$

(3) $(2D.8)_{16}$ to decimal.

$$(2D.8)_{16} = 2\times 16^1 + 13\times 16^0 + 8\times 16^{-1}$$
$$= 32 + 13 + 0.5$$
$$= \boxed{(45.5)_{10}}$$

(4) $(35.25)_{10}$ to octal.

		remainder
8	35	
8	4	3
	0	4

$(35)_{10} = (43)_8$

$$\begin{array}{r} 0.25 \\ \times\ 8 \\ \hline 2.0 \end{array}$$

$(0.25)_{10} = (0.2)_8$

$$\boxed{(35.25)_{10} = (43.2)_8}$$

(5) $(12E.2)_{16}$ to binary.

1 2 E . 2

0001 0010 1110 . 0010 → trailing

000 → leading

$$\boxed{(12E.2)_{16} = (1\ 0010\ 1110.001)_2}$$

(6) $(110.01)_2$ to octal.

110 . 01

010 → trailing

6 . 2

$$\boxed{(110.01)_2 = (6.2)_8}$$

(7) $(3C.2)_{16}$ to octal.

3 C . 2

0011 1100 . 0010

7 4 . 1

$$\boxed{(3C.2)_{16} = (74.1)_8}$$

(8) $(72.4)_8$ to hexadecimal.

7 2 . 4

111 010 . 100

100 0 → trailing

Leading 00 11

3 A . 8

$$\boxed{(72.4)_8 = (3A.8)_{16}}$$

2. (1) $(547)_{10}$ to BCD.

$$\begin{array}{ccc} 5 & 4 & 7 \\ \downarrow & \downarrow & \downarrow \\ 0101 & 0100 & 0111 \end{array}$$

$$(547)_{10} = (0101\ 0100\ 0111)_{BCD}$$

(2) $(001001100001)_{BCD}$ to decimal.

$$\begin{array}{ccc} 0010 & 0110 & 0001 \\ \downarrow & \downarrow & \downarrow \\ 2 & 6 & 1 \end{array}$$

$$(0010\ 0110\ 0001)_{BCD} = (261)_{10}$$

3. Gray code. (Page 5 of 6.)

5-bit code: $G_4G_3G_2G_1G_0$. As discussed in class, the bit patterns are as follows:

G_0: 0110.

G_1: 00111100.

G_2: 0000111111110000.

G_3: 00000000111111111111111100000000.

G_4: 0000000000000000111111111111111111111111111111110000000000000000.

Decimal	Gray Code
0	00000
1	00001
2	00011
3	00010
4	00110
5	00111
6	00101
7	00100
8	01100
9	01101
10	01111
11	01110
12	01010
13	01011
14	01001
15	01000
16	11000
17	11001
18	11011
19	11010
20	11110
21	11111
22	11101
23	11100
24	10100
25	10101
26	10111
27	10110
28	10010
29	10011
30	10001
31	10000

6/6

4. (1) 1111

Four "1"s → odd parity bit is "1".

(2) 100101

Three "1"s → odd parity bit is "0".

5. (1) 101011

Four "1"s → even parity observed

→ no error.

(2) 1000

One "1" → even parity violated

→ in error.