# CpE 111 - HW#1 solutions.

1. Givone 2.10

a. $101101.1_2 = 1\times 2^5 + 1\times 2^3 + 1\times 2^2 + 1\times 2^0 + 1\times 2^{-1}$

$= 45.5_{10}$

b. $362_8 = 3\times 8^2 + 6\times 8^1 + 2\times 8^0$

$= 242_{10}$

g. $2C3_{16} = 2\times 16^2 + C\times 16^1 + 3\times 16^0$

$= 707_{10}$

Givone 2.11

a. $42_{10} = 101010_2$

b. $78.5 = 1001110.1_2$

e. $204_8 = 10000100_2$

Givone 2.14

a.

$2 \,\underline{|\,163}\ \cdots 1$
$2 \,\underline{|\,81}\ \cdots 1$
$2 \,\underline{|\,40}\ \cdots 0$
$2 \,\underline{|\,20}\ \cdots 0$
$2 \,\underline{|\,10}\ \cdots 0$
$2 \,\underline{|\,5}\ \cdots 1$
$2 \,\underline{|\,2}\ \cdots 0$
$2 \,\underline{|\,1}\ \cdots 1$
$0$

$0.75\times 2 = 1.50 \ \cdots 1$

$.5\times 2 = 1 \ \cdots 1$

$\therefore 163.75_{10} = 10100011.11_2$

#2

$$
\begin{array}{r|l}
2 & 202 \quad \cdots 0 \\
2 & 101 \quad \cdots 1 \\
2 & 50 \quad \cdots 0 \\
2 & 25 \quad \cdots 1 \\
2 & 12 \quad \cdots 0 \\
2 & 6 \quad \cdots 0 \\
2 & 3 \quad \cdots 1 \\
2 & 1 \quad \cdots 1 \\
 & 0
\end{array}
$$

$0.9 \times 2 = 1.8 \quad \cdots 1$

$.8 \times 2 = 1.6 \quad \cdots 1$

$.6 \times 2 = 1.2 \quad \cdots 1$

$.2 \times 2 = 0.4 \quad \cdots 0$

$.4 \times 2 = .8 \quad \cdots 0$

repeats.

$\therefore 202.9_{10} = 11001010.11100\,1100\ldots_2$

c. $163.75_{10} = 243.6_8$

$202.9_{10} = 312.71463\,1463\ldots_8$

d. $163.75_{10} = A3.C_{16}$

$202.9_{10} = CA.E66\ldots_{16}$

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2. a. $2^2 = 4$

b. $2^5 = 32$

c. $2^6 = 64$

3. a. $16 \times 2^{20} \times 8 = 134217728$ bits

b. $16 \times 2^{20} = 16777216$ bits

c. $64 \times 2^{10} \times 8 = 524288$ bits

d. $256 \times 2^{10} \times 8 = 2097152$ bits

4. 8 directions $\Rightarrow$ 8 bit patterns needed. #3

$2^3 = 8$

So, 3-bit word can be used.

DIRECTION = $d_2 d_1 d_0$.

For 4 more directions, 4-bit word is needed, since...

$2^3 = 8 < 12 < 2^4 = 16.$

Since $16 - 12 = 4$, 4 bit patterns are not used.

5. a. 43
b. 25
c. 57
d. 25 (same as b, mistakenly...)

6. a. 117
b. 205
c. 162

7. a. 111011
b. 1001111
c. 1101011

9. Range : 00000 ~ 99999
So, the max # is 99999, 99999+1 different #s.
$2^{16} = 65536 < 99999+1 < 2^{17} = 131072$.
So, 17-bit word can be used to express all 5-digit decimal #s.

8. a. $1\ 1111\ 1011\ 0000_2 = 8112_{10}$
b. $1010\ 1011\ 1100_2 = 2748_{10}$
c. $0111\ 0001\ 1101\ 0010_2 = 29138_{10}$
d. $1000\ 0000\ 1011\ 1010_2$ $32954_{10}$