Seminar 1

$0x1111 = \underbrace{0001}\underbrace{0001}\underbrace{0001}\underbrace{0001}$ b2

01 01 01 01 b4

1 0 4 2 1 b8

$16^3 + 16^2 + 16 + 1$ b10

$4096 + 256 + 16 + 1$

$= 4369$

2: 1111 1111 0000 0000

4: 3 3 3 3 0 0 0 0

8: 1 7 7 4 0 0

16: F F 0 0

~~15 · 16^3 + 15 · 16^2 = 4096 + 256~~

~~= 4352~~

$2^8 \cdot (2^8 - 1) = 2^{16} - 2^8$

$= 256^2 - 256$

0x FEED

2: 1111 1110 1110 1101

4: 3 3 3 2 3 2 3 1

8: 1 7 7 3 5 5

0000000100010010 + 1

0000000100010011

$1 + 2 + 16 + 128 = 275$

$= 275$

16 · 16 = 36, 6, 16 → 256

256 · 16 = 36, 30, 12 → 256 → 4096

65 · 256 · 256 = 36

16 · 8 = 48, 8 → 128

0101 1100 1111 0011 | 1
1111 1111 0000 0000

1 | 0101 1011 1111 0011

1111 1111 1111 1111 +
0000 0000 0000 0001

1 | 0000 0000 0000 0000

0101 1100 1111 0011
0101 1100 1111 0011 | AND

0101 1100 1111 0011

1100 0110 1001 1110
1001 1111 0110 1100 | XOR
1100 0110 1001 1110 | XOR

1001 1111 0110 1100

101.101

$$= 4+1+\frac{1}{2}+\frac{1}{8} = \frac{32+8+4+1}{8} = \frac{45}{8} = \frac{45 \cdot 5^3}{1000}$$

$$= \frac{45 \cdot 125}{1000}$$

11.11 0,101

0,(6)

7. $b_0 b_1 \dots b_{n-1}$

$$x = \sum_{i=0}^{n-2} b_i 2^i - 2^{n-1} \cdot b_{n-1}$$

$$2^{n-1} = (2^{n-2} + \dots + 2^1 + 1) + 1$$

$$x = \sum_{i=0}^{n-2} b_i 2^i - \left(\sum_{i=0}^{n-2} 2^i + 1\right)$$

Bt. $b_{n-1} = 1 \Rightarrow x < 0$

$$n + x = \sum_{i=0}^{n-2} 2^i (b_i - 1) - 1$$

$x < 0$

$$-x = \sum_{i=0}^{n-2} 2^i (1 - b_i) + 1$$

Ex. $x = 2^0 b_0 + 2^1 b_1 + \ldots + 2^{n-1} b_{n-1}$

$$\log_2(x) = \log_2\left(2^{i_{max}} \left(\frac{1 b_0 + 2 b_1 + 2^2 b_2 + \ldots + 2^{n-1} b_{n-1}}{2^{i_{max}}}\right)\right)$$

$$= \log_2\left(2^{i_{max}} \left[b_{i_{max}} + b_{i_{max}-1} \cdot \frac{1}{2} + \ldots + \frac{b_0 \cdot 2^0}{2^{i_{max}}}\right)\right]$$

$$\log_2 x = \log_2 2^{i_{max}} + \log_2(\ldots)$$

$$= i_{max} + \underbrace{\log_2(\ldots)}_{< 1}$$

$$\Rightarrow [\log_2 x] = i_{max}$$

T. 8