Course Name: _Computer Architecture Lab,

Course Number and Section: **14:332:333:04**

Experiment: [Experiment # [1] – Intro To GIT and Number Representation]

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LAB-1 RUID → 173000011 Net ID → Sbk91

1.1 a

1) 0b10001110

- Binary to Hex,

⇒ 0b 10001110

1000 → 8

1110 → E ⇒ 14.

Hex = 0X

⇒ 0X8E

Binary to Decimal

⇒ Decimal = 0d

⇒ 0b 10001110

$0 \times 2^0 = 0$

$1 \times 2^1 = 2$

$1 \times 2^2 = 4$

$1 \times 2^3 = 8$

$0 \times 2^4 = 0$

$0 \times 2^5 = 0$

$0 \times 2^6 = 0$

$1 \times 2^7 = 128$

142

⇒ 0d 142

2) 0x C3BA

→ Hex to Binary

⇒ C3BA

A = 10, B = 11, C = 12

⇒ 1100 0011 1011 1010
   C 3 B A

⇒ 0b 1100001110111010

→ Hex to Decimal

$(C3BA)_{16} = (\ \ )_{10}$

⇒ $A \times 16^0 = 10$

$B \times 16^1 = 176$

$3 \times 16^2 = 768$

$C \times 16^3 = 49152$

50106

⇒ 0d 50106

3) 0b100100100

Bin to Hex

$\rightarrow$ $\underbrace{0001}_{1}\underbrace{0010}_{2}\underbrace{0100}_{4}$

$\Rightarrow$ 0x124

Bin to Decimal

$\Rightarrow$ 100100100

$0\times2^0 + 0\times2^1 + 1\times2^2 +$
$0\times2^3 + 0\times2^4 + 1\times2^5 +$
$0\times2^6 + 0\times2^7 + 1\times2^8$

$\Rightarrow$ 0d 292

4) 0xBCA1

Hex to Bin

$\rightarrow$ A = 10

B = 11

C = 12

$\underbrace{1011}_{B}\underbrace{1100}_{C}\underbrace{1010}_{A}\underbrace{0001}_{1}$

$\Rightarrow$ 0b 1011110010100001

Hex to Dec

$\rightarrow$ BCA1

$1\times16^0 = 1$
$10\times16^1 = 160$
$12\times16^2 = 3072$
$11\times16^3 = 45056$

48289

$\Rightarrow$ 0d 48289

5 → 0 ← binary.

A Decimal $0d \times 0$

A Hex $0X\underbrace{0000}_{0}$

6 → 42

→ 0d42

A → $0X\underbrace{0100}_{4}\underbrace{0010}_{2}$

→

2	42	0
2	21	1
2	10	0
2	5	1
2	2	0
	1	

A ⇒ 0b101010

7 → 0X BAC4

Hex to Binary.

B=11, A=10, C=12

A → $0b\underbrace{1011}_{B}\underbrace{1010}_{A}\underbrace{1100}_{C}\underbrace{0100}_{4}$

Hex to Decimal

BAC4

→ $4 \times 16^0 = 4$

→ $12 \times 16^1 = 192$

→ $10 \times 16^2 = 2560$

→ $11 \times 16^3 = 45056$

47812

A → 0d 47812

(b) 2^{14}

$\Rightarrow 2^{10} \cdot 2^{4}$

$\Rightarrow 16Ki$

$\Rightarrow 2^{42}$

$\Rightarrow 2^{40} \cdot 2^{2}$

$= 4Ti$

$\rightarrow 2^{43}$

$\Rightarrow 2^{40} \cdot 2^{3}$

$\Rightarrow Ti \cdot 8$

$\Rightarrow 8Ti$

$\Rightarrow 2^{23}$

$\Rightarrow 2^{20} \cdot 2^{3}$

$\Rightarrow 8Ki$

$\Rightarrow 2^{58}$

$\Rightarrow 2^{50} \cdot 2^{8}$

$\Rightarrow Pi \cdot 256$

$\Rightarrow 256Pi$

$\Rightarrow 2^{64}$

$\Rightarrow 2^{60} \cdot 2^{4}$

$\Rightarrow 16Ei$

KMKTPEZY

(C) 1) 2Ki
$\Rightarrow 2 \cdot 2^{10}$
$\Rightarrow 2^{11}$

5) 64Mi
$= 2^6 \cdot 2^{20}$
$\Rightarrow 2^{26}$

(2) → 512Pi
$\Rightarrow 2^9 \cdot 2^{50}$
$\Rightarrow 2^{59}$

6) 8Ei
$\Rightarrow 2^3 \cdot 2^{60}$
$\Rightarrow 2^{63}$

3) 256Ki
$\Rightarrow 2^8 \cdot 2^{10}$
$\Rightarrow 2^{18}$

4) 32Gi
$\Rightarrow 2^5 \cdot 2^{30}$
$\Rightarrow 2^{35}$

(2.2)

(1) Unsigned → 11111111 → 255

$$\begin{array}{r} 11111111 \\ + \quad 1 \\ \hline 1\boxed{00000000} \end{array}$$

→ 0 (larger integer +1)

b) Range of N-bit 2's Complement
$-(2^{(n-1)}) \ldots 0 \ldots 2^{(n-1)} - 1$
$\Rightarrow -(2^{(8-1)}) = -128 \ldots 0 \ldots 2^{(8-1)} - 1 = 127$
[Two's Complement] 127, -128

+128 cannot be represented in Eight bits. The maximum positive integer that can be represented in Eight bits is 127_{10}

(2) 0 → 0b 0000 0000

3 → 0b 0000 0011

−3 → N/A

b) Two's Complement → 0 → 0b0000 0000

+3 → 0000 0011

−3 → 1111 1100 ← inverse

1 (+1)

−3. ← $\boxed{\text{0b 1111 1101}}$

(3) + 42

Unsigned of −42 → N/A

Signed bit ← 00101010 ← +42

1010101 ← inverse

+ 1 ← add 1

Signed bit (−) ← $\boxed{1}\boxed{1010110}$ ← −42

⇒ 0b00101010 → +42, 0b11010110 → −42

↳ 2's complement, Unsigned

2's Complement ↲

(4) There is no Such integer. Arbitrary 8-bit mapping Could choose to represent no from 1 to 256 instead of 0 to 255

(5). Using 2's complement of 6 to Prove that x and x'+1 Sum to 0 where x = +6 in binary, x' = inverse of +6 in binary.

+6 →	0	0000110	← x
	1	1111001	← x'
+		1	
	1	1111010	← x'+1

Adding x and x'+1 ⇒

$$\begin{array}{r} 00000110 \\ +\ 11111010 \\ \hline 1\ \boxed{00000000} \leftarrow 0 \end{array}$$

∴ Hence Proved $x + (x'+1) = 0$

(6) Decimal is the radix for human hand Calculations. It is related to fact that human have 10 fingures.

→ Binary numerals are useful for Computers. Binary Signals are less likely to reproduce than radix Signals as there is more distance.

→ Hexadecimal numbers are Convenient for displaying Binary numbers. one Hex digit Corresponds four binary digits.

3.1

1) 2

2) $2\ TiB \Rightarrow 2 \times 2Ki \times 2Mi \times 2Gi \times 2Ti$

$\Rightarrow 2^{10} \times 2^{10} \times 2^{10} \times 2^{10} \times 2^{1} \Rightarrow 41\ bits$

3) 0