Kenny Hoang CS3340 HW#2 9/13/2016

A = 10
B = 11
C = 12
D = 13
E = 14
F = 15

1.a. $FACE_{16}$ → $F^3\ A^2\ C^1\ E^0$

$= (15 \times 4096) + (10 \times 256) + (12 \times 16) + (14 \times 1)$

$= 61440 + 2560 + 192 + 14 = \boxed{64206_{10}}$

b. $2BAD_{16}$ → $2^3\ B^2\ A^1\ D^0$

$= (2 \times 4096) + (11 \times 256) + (10 \times 16) + (13 \times 1)$

$= 8192 + 2816 + 160 + 13 = \boxed{11181_{10}}$

c. $4DAD_{16}$ → $4^3\ D^2\ A^1\ 0^0$

$= (4 \times 4096) + (13 \times 256) + (10 \times 16) + (13 \times 1)$

$= 16384 + 3328 + 160 + 13 = \boxed{19885_{10}}$

2a. -1963_{10} ⇒

	Q	R	
1963/2	981	1	1
981/2	490	1	2
490/2	245	0	4
245/2	122	1	8
122/2	61	0	16
61/2	30	1	32
30/2	15	0	64
15/2	7	1	128
7/2	3	1	256
3/2	1	1	512
1/2	0	1	1024

$1963_{10} = 01111\ 0101\ 0111_2$

$= 1000\ 0101\ 0100$ ← 2's complement

$+ \quad\quad\quad 1$

$-1963_{10} = \underline{1000\ 0101\ 0101}_2$

$= 1111\ 1000\ 0101\ 0101$ → 16-bit

replicate sign for extension to 32-bit

1111 1111 1111 1111 1111 1000 0101 0101

F F F F F 8 5 5 ⇒ $\boxed{-1965_{10} = FFFFF855_{16}}$

b. 2021_{10} ⇒

2021/2	1010/2	505/2	252/2	126/2	63/2	31/2	15/2	7/2	3/2	1/2	0
1	0	1	0	0	1	1	1	1	1	1	

$= \boxed{0xFFFFF855}$

$2021_{10} = 0111\ 1110\ 0101$ → 0000 0111 1110 0101 → 16-bit

$= 0000\ 0000\ 0000\ 0000\ 0000\ 0111\ 1110\ 0101$ → 32-bit

0 0 0 0 0 7 E 5 ⇒ $\boxed{2021_{10} = 7E5_{16} = 0x7E5}$

Scanned by CamScanner

3. a. -0.1875 (3 ↑, 16 ↑)

$-0.1875 = -3/16 = -1 \times 11_2 \times 2^{-4} = -1 \times 1.1_2 \times 2^{-3}$

$S = 1$ since -0.1875 is negative

Exponent $= -3 +$ Bias $\rightarrow$ $-3 =$ Exponent $-$ Bias $\rightarrow -3 + 127 = 124$

$= 124 = 01111100_2$

124 / 2	0
62 / 2	0
31 / 2	1
15 / 2	1
7 / 2	1
3 / 2	1
1 / 2	1
0	

$-0.1875 = -3/16 = -1 \times 1.1_2 \times 2^{-3}$

Fraction: 10000000000000000000000

S	Exponent	Fraction
1	01111100	10000000000000000000000

$-0.1875 =$ 1 01111100 10000000000000000000000

(15 ↑, 32 ↑)

b. $0.46875 = 15/32 = 1 \times 1111_2 \times 2^{-5} = 1 \times 1.111_2 \times 2^{-2}$

$S = 0$ since 0.46875 is positive

Exponent $= -2 + 127 \rightarrow$ Bias (Single) $= -2 + 127 = 125 = 01111101_2$

125 / 2	1
62 / 2	0
31 / 2	1
15 / 2	1
7 / 2	1
3 / 2	1
1 / 2	1
0	

$0.46875 = 15/32 = 1 \times 1.111_2 \times 2^{-2}$

Fraction $=$ 11100000000000000000000

S	Exponent	Fraction
0	01111101	11100000000000000000000

$0.46875 =$ 0 01111101 11100000000000000000000

4. a. 3F400000 $=$ 0011 1111 0100 0000 0000 0000 0000 0000

$=$

S	Exponent	Fraction
0	01111110	10000000000000000000000

$S = 0$ Exponent $= 01111110 = 2^6 + 2^5 + 2^4 + 2^3 + 2^2 + 2^1 = 64 + 32 + 16 + 8 + 4 + 2 = 126$

Fraction $= 10000000000000000000000 = (1/2^1 + 0/2^2 + 0/2^3 + \ldots) = 1/2$

$x = (-1)^0 \times (1 + 0.1_2) \times 2^{(126 - 127)}$

$= 1 \times 1.5 \times 2^{-1}$

$= \boxed{0.75}$

Scanned by CamScanner

4b. BE000000 = B E 0 0 0 0 0 0

= 11 14 0 0 0 0 0 0

= 1011 1110 0000 0000 0000 0000 0000 0000

= | 1 | 01111100 | 00000000000000000000000 |

S Exponent Fraction

S = 1

Fraction = 00000000000000000000000 = $(0/2^1 + 0/2^2 + 0/2^3 + \ldots) = 0$

Exponent = 01111100 = $2^6 + 2^5 + 2^4 + 2^3 + 2^2 = 64 + 32 + 16 + 8 + 4 = 124$

$X = (-1)^1 \times (1 + 0.0_2) \times 2^{(124-127)}$

$= (-1) \times (1.00) \times 2^{-3}$

$= -0.125$

Scanned by CamScanner