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CS 3340 HW#2

**1) Assuming integers are represented as 16-bit words, convert the following hexadecimal numbers to decimal numbers (show your work).**

**a. FACE**

FACE = 15 \* (16^3) + 10 \* (16^2) + 12 \* (16^1) + 14 \* (16^0)

= 61440 + 2560 + 192 + 14 = 64206

**b. 1BFF**

1BFF = 1 \* (16^3) + 11 \* (16^2) + 15 \* (16^1) + 15 \* (16^0)

= 4096 + 2816 + 240 + 15 = 7167

**2) Assuming integers are represented as 32-bit words convert the following decimal numbers to hexadecimal numbers (show your work).**

**a. -128**

Convert 128 to binary because it is negative:

128 = 2^7 so in binary it is equal to 10000000 (all zeroes and a 1 in the 2^7 place)

Take two’s compliment for negative:

01111111 + 1 = 10000000

Convert to hex:

1000 0000 = 80 (1 in the 2^3 place and all zeroes for the 2nd 4 chunk)

**b. 2014**

2014/16 = 125 r 14, 125/16 = 7 r 13, 7/16 = 0 r 7

Thus, 13-13-14 = 7DE

**3) Represent following floating point numbers in IEEE single-precision (32-bit) format:**

**a. -0.4375**

S-bit = 1 since negative

Convert to binary: .4375 \* 2 = 0.875, 0.875 \* 2 = 1.75, 1.75 \* 2 = 3.5, 3.5 \* 2 = 7 ->

0, 1,3,7 = 0.0111

Normalize:

1.11 \* 2^-2

Fraction = 11000..00

Exponent = -2 + 127 = 125 = 01111101

Final = S-bit + Exponent + Fraction = 10111110111000..00

**b. 0.9375**

S-bit = 0 since positive

Convert to binary: .9375 \* 2 = 1.875, 1.875 \* 2 = 3.75, 3.75 \* 2 = 7.5, 7.5 \* 2 = 15 ->

1,3,7,15 = 1111

Normalize:

1.111 \* 2^3

Fraction = 11100..00

Exponent = 3 + 127 = 130 = 10000010

Final = 01000001011100..00

**Show the steps done to reach the answer for each (i.e. how to get the S-bit, the exponent, and the fraction field of the answer).**

**4) What is the decimal value of the following IEEE single-precision (32-bit) floating point numbers (which are shown in hexadecimal)?**

**a. 3E000000**

Convert to binary: 0011 1110 0000 0000 0000 0000 0000 0000

Positive

Exponent = 01111100 = 124. E + 127 = 124 , E = -3

Decimal = 1 \* 2 ^ -3 = .125

**b. BF000000**

Convert to binary: 1011 1111 0000 0000 0000 0000 0000 0000

Negative

Exponent = 01111110 = 126. E + 127 = 126, E = -1

Decimal = -1 \* 2^-1 = -.5