Name Answers

CE-1901-11 – Dr. Durant – Quiz 8
Winter 2016-'17, Week 10 Quiz

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1. (2 points) In binary, multiply A=0101 by B=1011, showing all 4 properly shifted intermediate products. Calculate the overall sum, showing the correct number of output bits needed to handle the largest possible product. In decimal, confirm whether your results agree with ~~5x12 = 60~~ $5 \times 11 = 55$
2. (3 points) ***Express*** G = -7 as a 6-bit number. Use this value of G as the starting point for each ***calculation*** below.
   a. Arithmetic right shift by 2 bits (binary and decimal)
   b. Logical right shift by 2 bits (binary and decimal)
   c. Rotate left by 1 bit (binary and decimal)

(1)

```
      0101
    x 1011
    ------
      0101
     0101
    0000
 + 0101
 ---------
  00110111
```

$\underbrace{0011}_{3\times16=48}\ \underbrace{0111}_{7}$ → 55 ✓

(2) 7 = 111

Expand to 6b & Flip: 111000

+1: 111001 ← -7

(a) $\overbrace{11}^{\text{repeat}}1110$ = -2 (-7/4, round towards -∞)

(b) 001110 = 14

(c) 110011 = -13

note, moved 1 to L

3. (5 points) Interpret 0xC1100000 as a single-precision IEEE 754 floating point number...

   a. Write the value in binary and box in the sign, exponent, and mantissa
   b. Calculate 2^{exponent} after accounting for the bias.
   c. Write the complete binary fraction based on the mantissa and convert it to a decimal fraction.
   d. Multiply the contributions of the sign, exponent, and mantissa to arrive at the decimal value.

(32b total)

(a) $\underbrace{\boxed{1}}_{s}\ \underbrace{\boxed{100\ 0001\ 0}}_{e}\ \underbrace{\boxed{001\ 0\ldots}}_{m}$

(b) $e = (128+2) - 127 = \boxed{3}$

$2^e = 8$

leading 1

(c) $1.001 = 1\frac{1}{8} = \boxed{1.125}$

2^{-3}

(d) $-1 \times 8 \times 1.125 = \boxed{-9}$

Name *Answers*

CE-1901-12 – Dr. Durant – Quiz 8
Winter 2016-'17, Week 10 Quiz

1. (2 points) In binary, multiply A=1101 by B=0110, showing all 4 properly shifted intermediate products. Calculate the overall sum, showing the correct number of output bits needed to handle the largest possible product. In decimal, confirm whether your results agree with 13×6 = 78
2. (3 points) ***Express*** G = -9 as a 6-bit number. Use this value of G as the starting point for each ***calculation*** below.
   a. Arithmetic right shift by 2 bits (binary and decimal)
   b. Logical right shift by 2 bits (binary and decimal)
   c. Rotate right by 2 bits (binary and decimal)

①
```
       1101
     × 0110
     ------
       0000
      1101
     1101
  + 0000
  ---------
   01001110
```
$\underbrace{0100}_{4\times16=64}\ \underbrace{1110}_{14}$

$\underbrace{64 \quad 14}_{78\ ✓}$

② 9 : 1001

extend to 6b & flip: 110110

+1 : 110111 ← −9

(a) 111101 = −3 (−9/4, round towards −∞)

(b) 001101 = 13

(c) 111101 = -3

0 moves 2 R

3. (5 points) Interpret 0xC0880000 as a single-precision IEEE 754 floating point number...

a. Write the value in binary and box in the sign, exponent, and mantissa

b. Calculate $2^{exponent}$ after accounting for the bias.

c. Write the complete binary fraction based on the mantissa and convert it to a decimal fraction.

d. Multiply the contributions of the sign, exponent, and mantissa to arrive at the decimal value.

to 32b

(a) $\boxed{1}\boxed{100\ 0000\ 1}\boxed{000\ 1000\ 0\cdots}$

S e m

break @ 8b

(b) $e = (128+1) - 127 = 2$

$2^e = \boxed{4}$

(c) $1.0001 = 1\frac{1}{16} = \boxed{1.0625}$

2^{-4}

(d) $-1 \times 4 \times 1.0625$

$= \boxed{-4.25}$