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Question 2.

a. Using Q4.3:

- Op1A = 5.7

$\cdot\ 5.7 \times 2^3 = 45.6_{10} \xrightarrow{45} 0010\ 1101_2$

11 bit only in D2L

So Op1A = 00101.101

45 : 2 = 22	1	1
22 : 2 = 11	0	
11 : 2 = 5	1	
5 : 2 = 2	1	

2 : 2 = 1 | 0

$\hookrightarrow 101101_2$

- Op2A = 7.2

$\cdot\ 7.2 \times 2^3 = 57.6 \xrightarrow{57} 0011\ 1001_2$

57 : 2 = 28	1
28 : 2 = 14	0
14 : 2 = 7	0
7 : 2 = 3	1

3 : 2 = 1 | 1

$\hookrightarrow 111001_2$

So Op2A = 00011.001

b. (5.7 + 7.2) =

```
   111 001
   0010 1101
 + 0011 1001
 -----------
B: 0110 0110
```

→ B = + 1100.110

c. $0110\ 0110_2 = +(1\times 2^3 + 1\times 2^2 + 1\times 2^{-1} + 1 \times 2^{-2})$

$= 12.75_{10}$

So C = 12.8

Question 3.

a. Using Q5.2:

- Op1A = 10.04

$\cdot\ 10.04 \times 2^2 = 40.16_{10} \xrightarrow{40} 0010\ 1000_2$

40 : 2 = 20	0
20 : 2 = 10	0
10 : 2 = 5	0
5 : 2 = 2	1
2 : 2 = 1	0

$\hookrightarrow 101000_2$

So Op1A = ~~10~~ 001010.00_2

- Op2A = 0.01
  $0.01 \times 2^2 = 0.04 \xrightarrow{0} 0000\ 0000_2$

So Op2A = 000000.00

b. 10.04 + 0.01

$$\begin{array}{r} 001010\ 00 \\ +\ 000000\ 00 \\ \hline 001010\ 00_2 \end{array}$$

So B = +01010.00

c. We have $B = 001010.00_2$
$= + (.. 1 \times 2^3 + 1 \times 2^1) = 10_{10}$

So C = 10.00

Question 4:

a. Using 4.3 format:

- Op1A = - 5.9
  $= -(5.9 \times 2^3) = -(47.2) \xrightarrow{47} -(0010\ 1111)_2$

47 : 2 = 23 | 1
23 : 2 = 11 | 1
11 : 2 = 5 | 1
5 : 2 = 2 | 1 ↳ 00101111_2
2 : 2 = 1 | 0 Convert bit : 11010000
Add 1 : 1101 0001

So Op1A = 11010001_2

a - Op2A = 5.7

$= 5.7 \times 2^3 = 45.6_{10} \xrightarrow{45}$ 0010 1101

45 : 2 = 22 | 1   2 : 2 : 1 | 0

22 : 2 = 11 | 0

11 : 2 = 5 | 1 101101_2

5 : 2 = 2 | 1

So Op2A = 00101101_2

b. (-5.5) - (5.7)

I would use ~~to~~ the cal: (-5.5) + (-5.7)

$-(5.7) = -(0010\ 1101)_2 = (1101\ 0010 + 1)_2$

$= 1101\ 0011_2$

```
  1101 0001
+ 1101 0011
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 1|10100100
```

So B = 1010 0100

c. We can see the sign bit = 1.

Perform 2's complement   11010 0100

−   1

11010 0011

Convert: 00101 1100

$00101\ 1100_2 = 1\times 2^3 + 1\times 2^1 + 1\times 2^0 + 1\times 2^{-1}$

$= 11.5$

So C = −11.5

Question 5:

a. floating point: s eee mmmm.

OpA = -3.5

Since we have 3 exp bit, the exp. offset is: $2^{3-1} = 3$

$(3.5) \times 2^4 = 56_{10} = 011\ 1000_2$

$56 : 2 = 28 \mid 0$ $\quad 3 : 2 = 1 \mid 1 \mid 1$

$28 : 2 = 14 \mid 0$ $\quad \hookrightarrow 11\ 1000$

$14 : 2 = 7 \mid 0$

$7 : 2 = 3 \mid 1$

and $= 1.1100 \times 2^1 = (-1)^1 \times 1.1100 \times 2^{4-3}$

$\hookrightarrow 100$

So OpA = 1 100 1100

b. We have: $(-1)^1 \times (1 + 2^{-1} + 2^{-2}) \times 2^1 = -3.5$

So OpB = -3.5

Question 6:

a. floating point: s eee mmmm.

OpA = 0.41

Since we have 3 exp bit, the exp. offset is $2^{3-1} = 3$

$0.41 \times 2^4 = 6.56 \xrightarrow{6} 0110_2$

$6 : 2 = 3 \mid 0$

$3 : 2 = 1 \mid 1 \mid 1$ $\quad \hookrightarrow 110_2$

0.0110

and $= 1.1000 \times 2^{-2} = 1.1000 \times 2^{1-3}$

$\hookrightarrow 001$

So OpA = 0 001 1000

b. We have 0 001 1000

& $(-1)^0 \times (1 + 2^{-1}) \times 2^{-2} = 0.375$

So $B = 0.38$

Question 7. $(-6) < (-35)$

At $A = -6_{10} = 0xFA$,

$B = -35_{10} = 0x\,DD$

$C = 0x\,22$

$D = 0x\,00$

$E = 0x\,1C = A + C =$

$$\begin{array}{r} {}^{10} \\ 0xFA \\ +\ 0x22 \\ \hline 0x11C \end{array}$$

and E is 8bit so it will return 0x1C with 1 on Cout of overflow.

$F = 0x\,FA$

$G = 0x\,22$

$H = 0x\,00$

$I = 0x\,01$

Question 8: $(46) < (16)$

$A = 0x\,2E$ $(= 46)$

$B = 0x\,10$ $(= 16)$

$C = 0x\,EF$

$D = 0x\,00$

$E = 0x\,1D$ where $E = A + C$

$$\begin{array}{r} {}^{1} \\ 0x\,2E \\ +\ 0x\,EF \\ \hline 0x11D \end{array}$$

$F = 0x2E$

$G = 0xFF$

$H = 0x00$

$I = 0x01$

so E will be returned as 1D and an overflow in the ADDER