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Exercise Assignment 5 (Chapter 3)

3.25a and c 2pts

3.25 Assuming nine-bit two's complement representation, convert decimal #s to binary, show effect ASL operation on it, and then convert results back to decimal.

a 94.

$$\begin{array}{r} 94 \\ \hline 2 \\ \hline 0 \end{array} \quad \begin{array}{r} 47 \\ 2 \\ \hline 1 \end{array} \quad \begin{array}{r} 23 \\ 2 \\ \hline 1 \end{array} \quad \begin{array}{r} 11 \\ 2 \\ \hline 1 \end{array} \quad \begin{array}{r} 5 \\ 2 \\ \hline 1 \end{array} \quad \begin{array}{r} 2 \\ 2 \\ \hline 0 \end{array} \quad \begin{array}{r} 1 \\ 1 \\ \hline 1 \end{array}$$

Two's complement: 001011110

ASL operation: 010111100

Decimal:

70543200

$$2^7 + 2^5 + 2^4 + 2^3 + 2^2 = 128 + 32 + 16 + 8 + 4. \\ = 188$$

Cont.

25

c

-62

$$\begin{array}{r} 62 \\ \hline 2 \\ \hline 0 \end{array} \quad \begin{array}{r} 31 \\ 2 \\ \hline 1 \end{array} \quad \begin{array}{r} 15 \\ 2 \\ \hline 1 \end{array} \quad \begin{array}{r} 7 \\ 2 \\ \hline 1 \end{array} \quad \begin{array}{r} 3 \\ 2 \\ \hline 1 \end{array} \quad \begin{array}{r} \\ \\ \hline \end{array}$$

$$\begin{array}{r} 000111110 \\ 1110000001 \\ \hline 1110000001 \\ + 1 \\ \hline \end{array} \quad \begin{array}{l} \text{Binary} \\ \text{Invert} \\ \text{Add 1 bit} \end{array}$$

1110000010 Two's complement

C=1

110000100 ASL.

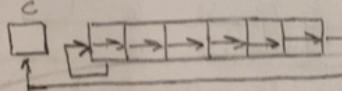
$$2^8 + 2^7 + 2^2 = 388 \quad \text{Decimal.}$$

3.26a and b 2pts

26 a, b

a Write the RTL specification for arithmetic shift right on six bit cell.

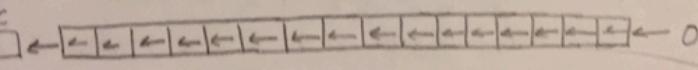
ASR



$$C \leftarrow r<5>, r<1...5> \leftarrow r<0...4>, r<0> \leftarrow r<0>$$

b Write the RTL specification for an arithmetic shift left on a 16 bit cell.

ASL



$$C \leftarrow r<0>, r<0...15> \leftarrow r<1...16>, r<16> \leftarrow 0$$

3.28a and b 2pts

3.28

Assuming a 9 bit cell, show the effect of the rotate operation on each of the following values with the given initial values of C.

a

$$C=1 \text{ ROL } 0\ 0110\ 1101$$

$$C=0\ 110\ 1101\ 1011$$

b

$$C=0 \text{ ROL } 0\ 0110\ 1101$$

$$C=0\ 0\ 1101\ 1010$$

3.35b and c 2pts

3.35 Assuming a 9-bit two's complement binary representation, convert the following # from hexadecimal to decimal. Remember to check the sign bit.

b 0F5 0 1111 0101

$$2^7 + 2^6 + 2^5 + 2^4 + 2^2 + 2^0 = 245$$

c 100 1 0000 0000 binary

256

3.53b and c 2pts

3.53 For IEEE 754 single precision floating point, write the hexadecimal representation for the following decimal values -

b -1.0

1 = 1 binary

0 = 0 binary

1.0×10^0

Excess = 127 = 0111 1111

1011111100000000

c -0.0

$0.0 \times 10^0 = 0$

0000