Exercise Assignment 5

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25a

Assuming nine-bit two's complement representation, convert each of the following decimal numbers to binary, show the effect of the ASL operation on it, and then convert the result back to decimal. Repeat with the ASR operation:

94
BIN → 0 0101 1110
ASL → 0 1011 1100
DEC → 188
ASR → 0 0101 1110 → 94

25c

Assuming nine-bit two's complement representation, convert each of the following decimal numbers to binary, show the effect of the ASL operation on it, and then convert the result back to decimal. Repeat with the ASR operation:

-62
BIN → 1 1100 0010
ASL → 1 1000 0100
DEC → -124 ASR → 0 1100 $0010_2 \rightarrow 194_{10}$

26a

Write the RTL specification for an arithmetic shift right on a six-bit cell.
$c \rightarrow r\langle 0\rangle, r\langle 0...5\rangle \rightarrow r\langle 1...6\rangle, r\langle 6\rangle \rightarrow C$

26b

Write the RTL specification for an arithmetic shift left on a 16-bit cell.
$C \leftarrow r\langle 0\rangle, r\langle 0...15\rangle \leftarrow rlangle1...16\rangle, r\langle 6\rangle \leftarrow c$

28a

C = 1, ROL 0 0110 1101
C=0, 0 1101 1011

28b

C = 0, ROL 0 0110 1101
C=0, 0 1101 1010

35b

Assuming nine-bit two's complement binary representation, convert the following numbers from hexadecimal to decimal. Remember to check the sign bit: 0F5

$0F5_{16} \rightarrow 0\ 1111\ 0101_2 \rightarrow 245_{10}$

35c

Assuming nine-bit two's complement binary representation, convert the following numbers from hexadecimal to decimal. Remember to check the sign bit: 100

$100_{16} \rightarrow 1\ 0000\ 0000_2 \rightarrow -255_{10}$

53b

For IEEE 754 single precision floating point, write the hexadecimal representation for the following decimal values: -1.0

$-1.0_{10} \rightarrow 1\ 0111\ 1111\ 000\ 0000\ 0000\ 0000\ 0000\ 0000_2 \rightarrow \mathrm{BF800000}_{16}$

53c

For IEEE 754 single precision floating point, write the hexadecimal representation for the following decimal values: -0.0

$-0.0_{10} \rightarrow 1\ 0000\ 0000\ 000\ 0000\ 0000\ 0000\ 0000\ 0000_2 \rightarrow 80000000_{16}$

References

Warford, J. (2009). *Computer systems* (4th ed.). Jones and Bartlett.