Homework 1

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August 28, 2020

1 Convert each of the following decimal integers into its natural binary equivalent.

a) $13 = 8 + 4 + 1 = 2^3 + 2^2 + 2^0 = 1101$

b) $44 = 1(32) + 0(16) + 1(8) + 1(4) + 0(2) + 0(1) = 101100$

2 Convert the following natural binary integer into its decimal equivalent: 1010110**.**

$$1010110 = 2^6 + 2^4 + 2^2 + 2^1 = 64 + 16 + 4 + 2 = 86$$

3 Perform the following binary addition: $10100 + 00111$**.**

$$\begin{array}{r} \overset{1}{} \\ 10100 \\ +\,00111 \\ \hline 11011 \end{array}$$

4 Perform the following hexadecimal addition: 0x66 + 0x75.

$$\begin{array}{r} 6\ 6 \\ +\ 7\ 5 \\ \hline 0\text{x}\,D\,B \end{array}$$

5 Suppose that P = 0x1234, and Q = 0x ABEF. In 16-bit hexadecimal arithmetic, calculate the value of the following expressions.

$$\begin{array}{r} \overset{1}{1}\ \overset{1}{2}\ 3\ 4 \\ +\,A\,B\,E\,F \\ \hline 0\text{x}\,B\,D\ 2\ 3 \end{array}$$

$$\begin{array}{r} A\,B\,E\,F \\ -\ 1\ 2\ 3\ 4 \\ \hline 9\ 9\,B\,B \\ \hline -\ 9\ 9\,B\,B \end{array}$$

6 Compute the results of the following decimal arithmetic operations using 8-bit two's complement arithmetic. Also, indicate whether or not arithmetic overflow occurs.

$$\begin{array}{r} {\scriptstyle 1\,1\ \ 1\,1} \\ 00011001 \\ +\,00001011 \\ \hline 00100100 \end{array}$$

No overflow

$$\begin{array}{r} 11000010 \\ -\,00110001 \\ \hline {\scriptstyle 1\ \ \ 1\,1\,1} \\ 11000010 \\ +\,11001111 \\ \hline 10010001 \end{array}$$

No Overflow