

EE 208: Tutorial#1

1- $(1A2.4)_{16} = (?)_{10} \Rightarrow 1 \times 16^2 + 10 \times 16^1 + 2 \times 16^0 + 4 \times 16^{-1} = (418.25)_{10}$

2- $(1011)_2 = (?)_{10} \Rightarrow 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 = (11)_{10}$

3- $(653.52)_{10} = (?)_8$ 1215.412...

$$\begin{array}{r} 81 \\ 8 \overline{) 653} \\ \underline{64} \\ 13 \\ \underline{8} \\ 5 \end{array}$$

$$\frac{653}{8} = 81 + \frac{5}{8} \Rightarrow (5)$$

$$\frac{81}{8} = 10 + \frac{1}{8} \Rightarrow (1)$$

$$\frac{10}{8} = 1 + \frac{2}{8} \Rightarrow (2)$$

$$\frac{1}{8} = 0 + \frac{1}{8} \Rightarrow (1)$$

$$0.52 \times 8 = 4.16 \Rightarrow (4)$$

$$0.16 \times 8 = 1.28 \Rightarrow (1)$$

$$0.28 \times 8 = 2.24 \Rightarrow (2)$$

4-Convert $(418.25)_{10}$ to Binary then to Octal and Hex

Binary: 1 1 0 1 0 0 0 1 0 . 0 1 0 1 0 0 0 1
 256 128 64 32 16 8 4 2 1 0.5 0.25
 (162) (34)

$$\begin{array}{ccccccc} 000110100010.0100 \\ \hline (1 & A & 2 & . & 4)_{16} \end{array}$$

$$\begin{array}{ccccccc} 110100010.010 \\ \hline (6 & 4 & 2 & . & 2)_8 \end{array}$$

5-Convert $(E8B)_{16}$ to Binary and Octal

Binary: $\begin{array}{ccc} E & 8 & B \\ 1110 & 1000 & 1011 \end{array}$
 Octal: 7 2 1 3 $\Rightarrow 7213$

6-Convert $(542)_8$ to Binary then to Hex

$$\begin{array}{ccc} 5 & 4 & 2 \\ 000101 & 100 & 010 \\ \hline (1 & 6 & 2)_{16} \end{array}$$

7-110011-011101

$$\begin{array}{r} 16 \\ 011101 \\ \hline 010116 \end{array}$$

8-110 X 101, (AB)₁₆ x (2F)₁₆

$$\begin{array}{r} 110 \text{ (6)} \\ 101 \text{ (5)} \\ \hline \end{array}$$

$$\begin{array}{r} 110 \\ 0000 \\ 11000 \\ \hline 11110 \text{ (30)} \end{array}$$

$$AB \times 2F = 1F65$$

$$\begin{array}{r} 1 \\ AB \\ 2F \\ \hline A05 \\ 1560 \\ \hline 1F65 \end{array}$$

9-30-10, 10-30 using signed binary

$$\begin{array}{l} 30: 011110 \\ 10: 001010 \end{array}$$

$$-30: 111110 \rightarrow 2'sc. \rightarrow 100010$$

$$-10: 01010 \rightarrow 2'sc. \rightarrow 110110$$

$$\begin{array}{r} 1111 \\ 30: 011110 \\ -10: 100110 \\ \hline 100000 \end{array}$$

$$\begin{array}{l} \text{End} \\ \text{carry} \\ 010100 \text{ (20)} \end{array}$$

$$\begin{array}{r} -30: 100010 \\ +10: 001010 \\ \hline -ve \text{ } 101000 \\ 2'sc. 110110 \\ \hline 110100 \text{ (-20)} \end{array}$$

Overflow & Underflow:

10-70+80, -70-80 8 bit signed number

$$\begin{array}{l} 70: 01000110 \\ -70: 11000110 \text{ (signed magnitude)} \\ 80: 01010000 \\ -80: 11010000 \end{array}$$

$$\begin{array}{r} +70: 01000110 \\ +80: 01010000 \\ \hline 10010110 \\ 150 \text{ overflow} \end{array}$$

Solution
increase
number
of bits

$$\begin{array}{r} -70 \rightarrow 2'sc. 11011010 \\ -80 \rightarrow 2'sc. 10110000 \\ \hline 01101010 \\ \text{underflow} \end{array}$$

11-BCD

$$\begin{array}{rcl} (694)_{10} & = & (0110 \ 1001 \ 0100)_{BCD} \\ (835)_{10} & = & (1000 \ 0011 \ 0101)_{BCD} \\ \begin{array}{r} 1 \\ 0110 \\ +1000 \\ 1111 \\ +0110 \\ \hline 0001 \ 0101 \end{array} & \begin{array}{r} 1001 \\ +0011 \\ 1100 \\ +0110 \\ \hline 1 \ 0010 \end{array} & \begin{array}{r} 0100 \\ +0101 \\ 1001 \\ +0000 \\ \hline 1001 \end{array} \end{array}$$

- 1.30** The following is a string of ASCII characters whose bit patterns have been converted into hexadecimal for compactness: 73 F4 E5 76 E5 4A EF 62 73. Of the eight bits in each pair of digits, the leftmost is a parity bit. The remaining bits are the ASCII code.
- (a) Convert the string to bit form and decode the ASCII.
- (b) Determine the parity used: odd or even?

73 F4 E5 76 E5 4A EF 62 73

73: 0_111_0011 s
 F4: 1_111_0100 t
 E5: 1_110_0101 e
 76: 0_111_0110 v
 E5: 1_110_0101 e
 4A: 0_100_1010 j
 EF: 1_110_1111 o
 62: 0_110_0010 b
 73: 0_111_0011 s

b) Odd

- 1.35** By means of a timing diagram similar to Fig. 1.5, show the signals of the outputs f and g in Fig. P1.35 as functions of the three inputs a, b, and c. Use all eight possible combinations of a, b, and c.

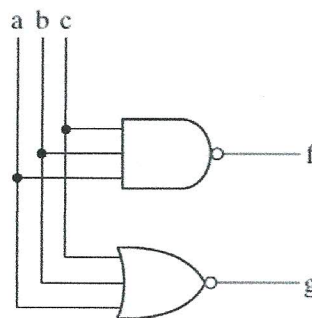
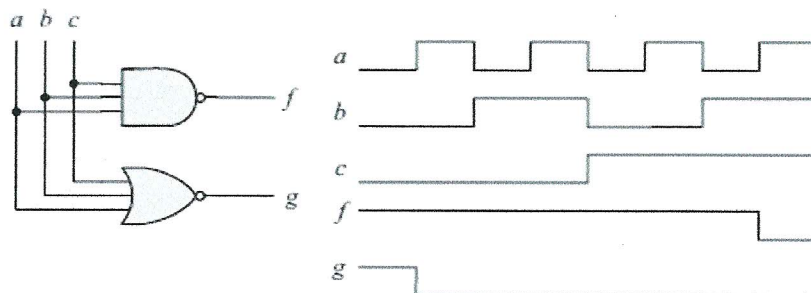


FIGURE P1.35

Solution:



Exercises

Q.1: Convert the following to Binary, Hex and Octal

$(166.5)_{10}$:

$\begin{array}{r} 128 \ 64 \ 32 \ 16 \ 8 \ 4 \ 2 \ 1 \\ 1 \ 0 \ 1 \ 0 \ 0 \ 1 \ 1 \ 0 \\ 38 \qquad 6 \qquad 2 \end{array}$

$\begin{array}{c} 10100110.1 \\ \hline (A \ 6)_{16} \cdot 8 \\ (2 \ 4 \ 6)_{8} \cdot 4 \end{array}$

Q.2:

$11001110 - 01111101$

$\begin{array}{r} 01011101 \\ 01111101 \\ \hline 01010001 \end{array}$

Hex: A6.8

Octal: 246.4

Q.3 : $112+50$ using 8 bit signed number, detect if there is an overflow and if there is, fix the problem.

$\begin{array}{r} 112 : 01110000 \\ 50 : 00110010 \\ \hline 10100010 \end{array}$

overflow use 9 bit

$\begin{array}{r} 01110000 \\ 00110010 \\ \hline 01010010 \\ 128 \ 64 \ 32 \ 16 \ 8 \ 4 \ 2 \ 1 \end{array}$

Q.4 : What is the largest positive number that can be represented in sign magnitude format using 16-bits? Express in hexadecimal.

$\begin{array}{c} 0111111111111111 \\ \hline 7 \ F \ F \ F \end{array}$

$32767 (2^{15}-1)$

Range

$1111111111111111 < No. < 0111111111111111$