



# EGC220 Class Notes 1/31/2023



**Baback Izadi**

Division of Engineering Programs

[bai@engr.newpaltz.edu](mailto:bai@engr.newpaltz.edu)

$$(45.5)_{10} \rightarrow ( \quad )_2, ( \quad )_8, ( \quad )_{16}$$

$2^1$        $4=2^2$        $2^3$        $2^4$

$$45 \div 16 = 2 \quad R_0 = 1 \quad \uparrow$$

$$2 \div 16 = 0 \quad R_1 = 2 \quad \uparrow$$

$$.5 \times 16 = 8.0 \quad \leftarrow \text{stop}$$

(2D.8)<sub>16</sub>

			1	0	0	
	32	16	8	4	2	
00	1	0	1	1	0	1

{ (2)      D

$$\frac{5}{1000} \cdot 2 = \frac{10}{8} = 1.25$$

$\times 2$

10	10	10	10
5	5	5	5

$\frac{10}{8} = 1.25$   
 $\frac{10}{8} = 1.25$   
 $\frac{10}{8} = 1.25$   
 (2 3 1.25)

$$\begin{array}{r}
 (25.6)_8 \\
 \times (12.2)_8 \\
 \hline
 \phantom{2} \phantom{5} \phantom{.} \phantom{6} \phantom{0} \\
 \phantom{2} \phantom{5} \phantom{.} \phantom{6} \phantom{0} \\
 2 \phantom{5} \phantom{.} \phantom{6} \\
 \hline
 (3 \phantom{3} \phantom{.} \phantom{6} \phantom{7} \phantom{4})_8
 \end{array}$$

$$\begin{array}{l}
 12 \div 8 = \cancel{1} \quad R = \underline{4} \\
 11 \div 8 = \underline{1} \quad R = 3 \\
 14 \div 8 = 1 \quad R = 6
 \end{array}$$

4 2 1  
X X X  
1 ( 0

1. Convert the following numbers

a.  $(001110110011.01101)_2 \rightarrow$  Hexadecimal and Octal

$(1B3.68)_{16}$

$(663.32)_8$

8 4 2 1  
X X X X  
1 0 1 1  
0 1 1 0  
1 0 0 0

~~8~~ 4 2 1  
1 1 1 0

8 4 2 1

b.  $(2EA03.4C)_{16} \rightarrow$  Binary and Octal

$(0010111010100000011010011001100)_2$

$(565003.23)_8$

c.  $(5034.25)_{10} \rightarrow$  Binary, Hexadecimal and Octal

4096 2048 1024 512 256 128 64 32 16 8 4 2 1  
1 0 0 1 1 1 0 1 0 1 0 1 0 1 0 1 0 0 . 5 25  
3 A A . 4

5034 426  
-4096  
-----  
938 170  
-512 128  
-----  
426 42

2. Perform the following arithmetic operations in the indicated base:

a.  $(32.4)_5 + (13.2)_5$

$$\begin{array}{r} 32.4 \\ + 13.2 \\ \hline \end{array}$$

$$\begin{array}{r} 01.1 \\ \hline \end{array}$$

cy = 1

$$6 \div 5 = 1 \text{ R} = 1$$

$$5 \div 5 = 1 \text{ R} = 0$$

$$\begin{array}{r} 2 + 5 \\ 7 \\ 32.4 \end{array}$$

b.  $(32.4)_5 - (13.2)_5$

$$\begin{array}{r} (14.2)_5 \\ - (32.4)_5 - (13.2)_5 \end{array}$$

$$32.4$$

$$\begin{array}{r} * 13.2 \\ \hline 203 \end{array}$$

$$8 \div 5 = 1 \text{ R} = 3$$

$$5 \div 5 = 1 \text{ R} = 0$$

$$7 \div 5 = 1 \text{ R} = 2$$

$$12 \div 5 = 2 \text{ R} = 2$$

$$10 \div 5 = 2 \text{ R} = 0$$

$$9 \div 5 = 1 \text{ R} = 4$$

$$\begin{array}{r} - 13.2 \\ \hline \end{array}$$

$$(14.2)_5$$

d.  $(13.2)_5 - (32.4)_5$

$$-(14.2)_5$$

$$\begin{array}{r} 2032 \\ 324 \\ \hline (1044.23)_5 \end{array}$$

$$5 - 8$$

$$-3$$

e.  $(128C4.2)_{16} + (58D.C4)_{16}$

$$\begin{array}{r} \phantom{00}11 \\ 128C4.20 \\ + 0058D.C4 \\ \hline \end{array}$$

$$\begin{array}{l} 17 \div 16 = 1 R = 1 \\ 21 \div 16 = 1 R = 5 \end{array}$$

f.  $(128C4.2)_{16} - (58D.C4)_{16}$

$$(12E91.E4)_{16}$$

$$\begin{array}{r} \phantom{00}B3 \\ 128C4.20 \\ - 0058D.C4 \\ \hline \end{array}$$

g.  $(101101.011)_2 - (100011.101)_2$

$$\begin{array}{r} \phantom{00}011 \\ 101101.011 \\ - 100011.101 \\ \hline 00101.110 \end{array}$$

$$\begin{array}{r} (12336.5C)_{16} \\ (001001.110)_2 \end{array}$$

h.  $(101101.011)_2 + (100011.101)_2$

$$\begin{array}{r}
 \phantom{1} \phantom{1} \phantom{1} \phantom{1} \phantom{1} \phantom{1} \phantom{1} \\
 101101.011 \\
 100011.101 \\
 \hline
 10100001.000
 \end{array}$$

i. Repeat g. and h. by first converting the numbers to hexadecimal and then performing the operation, before converting back to binary.

$$\begin{array}{r}
 \overbrace{(101101.011)_2}^{2D.6} - \overbrace{(100011.101)_2}^{23.A} \\
 2D.6 - 23.A
 \end{array}$$

$$\begin{array}{r}
 \phantom{0} \phantom{c} \phantom{+16} \\
 \overbrace{(2D.6)_{16}}^{c+16} \\
 - \overbrace{(23.A)_{16}} \\
 \hline
 09.C2
 \end{array}$$

$$\begin{array}{r}
 \phantom{1} \phantom{1} \\
 2D.6 \\
 + 23.A \\
 \hline
 51.0
 \end{array}$$

$17 \div 16 = 1 \text{ R } 1$

$(101101.011)_2 + (100011.101)_2$

