

# Temä laborator 1 ASC

1. a) 
$$\begin{array}{r|l} 4 & 2 \\ \hline 0 & 2 \\ \hline 0 & 1 \\ \hline 0 & 1 \\ \hline 1 & \end{array}$$

$$4(10) = 1010(2)$$

$$\begin{array}{r|l} 4 & 16 \\ \hline 0 & \end{array}$$

$$4(10) = 4(16)$$

b) 
$$\begin{array}{r|l} 10 & 2 \\ \hline 0 & 5 \\ \hline 1 & 4 \\ \hline 0 & 2 \\ \hline 1 & 1 \\ \hline 0 & 0 \\ \hline 1 & \end{array}$$

$$10(10) = 101010(2)$$

$$\begin{array}{r|l} 10 & 16 \\ \hline 0 & 0 \\ \hline 10 & \end{array}$$

$$10(10) = 11(16)$$

c) 
$$\begin{array}{r|l} 15 & 2 \\ \hline 1 & 7 \\ \hline 1 & 6 \\ \hline 1 & 3 \\ \hline 1 & 2 \\ \hline 1 & 1 \\ \hline 1 & 0 \\ \hline 1 & \end{array}$$

$$15(10) = 1111(2)$$

$$\begin{array}{r|l} 15 & 16 \\ \hline 0 & 0 \\ \hline 15 & \end{array}$$

$$15(10) = 15(16)$$

d) 
$$\begin{array}{r|l} 32 & 16 \\ \hline 32 & 2 \\ \hline 0 & 0 \\ \hline 0 & \end{array}$$

$$32(10) = 20(16)$$

$$\begin{array}{r|l} 32 & 2 \\ \hline 32 & 16 \\ \hline 0 & 8 \\ \hline 0 & 4 \\ \hline 0 & 2 \\ \hline 0 & 1 \\ \hline 1 & \end{array}$$

$$32(10) = 100000(2)$$

2) a) 
$$\begin{array}{r|l} 3 & 16 \\ \hline 0 & 0 \\ \hline 3 & \end{array}$$

$$3(10) = 3(16)$$

$$3(10) = 11(2)$$

$$\begin{array}{r|l} 3 & 2 \\ \hline 2 & 1 \\ \hline 1 & 0 \\ \hline 1 & \end{array}$$

$$b) \begin{array}{r|l} 11 & 16 \\ \hline 0 & \\ \hline 11 & \end{array}$$

$$11(10) = B(16)$$

$$\begin{array}{r|l} 11 & 2 \\ \hline 10 & \\ \hline 1 & \end{array}$$

$$11(10) = 1011(2)$$

$$\begin{array}{r|l} 11 & 2 \\ \hline 10 & \\ \hline 1 & \end{array} \begin{array}{r|l} 2 & \\ \hline 1 & \\ \hline 1 & \end{array} \begin{array}{r|l} 2 & \\ \hline 1 & \\ \hline 1 & \end{array} \begin{array}{r|l} 2 & \\ \hline 1 & \\ \hline 1 & \end{array}$$

$$c) \begin{array}{r|l} 16 & 16 \\ \hline 16 & \\ \hline 0 & \\ \hline 1 & \end{array}$$

$$16(10) = 10(16)$$

$$\begin{array}{r|l} 16 & 2 \\ \hline 16 & \\ \hline 0 & \end{array} \begin{array}{r|l} 2 & \\ \hline 8 & \\ \hline 8 & \end{array} \begin{array}{r|l} 2 & \\ \hline 4 & \\ \hline 4 & \end{array} \begin{array}{r|l} 2 & \\ \hline 2 & \\ \hline 2 & \end{array} \begin{array}{r|l} 2 & \\ \hline 1 & \\ \hline 1 & \end{array}$$

$$16(10) = 10000(2)$$

$$d) \begin{array}{r|l} 17 & 16 \\ \hline 16 & \\ \hline 1 & \\ \hline 1 & \end{array}$$

$$17(10) = 11(16)$$

$$\begin{array}{r|l} 17 & 2 \\ \hline 16 & \\ \hline 1 & \end{array} \begin{array}{r|l} 2 & \\ \hline 8 & \\ \hline 8 & \end{array} \begin{array}{r|l} 2 & \\ \hline 4 & \\ \hline 4 & \end{array} \begin{array}{r|l} 2 & \\ \hline 2 & \\ \hline 2 & \end{array} \begin{array}{r|l} 2 & \\ \hline 1 & \\ \hline 1 & \end{array}$$

$$17(2) = 10001(2)$$

$$(3) \quad \text{a) } 1010(16) = 0101(2) = 5(10)$$

$$0101(2) = 0 \cdot 2^0 + 1 \cdot 2^1 + 0 \cdot 2^2 + 1 \cdot 2^3 = 2 + 8 = 10(10)$$

$$a) 1010(2) = A(16)$$

$$b) 0111(2) = 7(16)$$

$$c) 1111(2) = F(16)$$

$$d) 10001010(2) = 8A(16)$$

$$e) 11010111(2) = 000110101111(2) = 1AF(16)$$

$$7) a) 3(16) = 0011(2)$$

$$b) 2F8(16) = 001011111000(2)$$

$$c) A(16) = 1010(2)$$

$$d) F(16) = 1111(2)$$

$$e) 2B(16) = 00101011(2)$$

5) a)  $1+1=10$   
 b)  $10+10=100$

c)  $111+1=1000$

d)  $1010-1=1001$

e)  $10100-10=0110$

6) a)  $9+1=10$

b)  $13+2=15$   
 c)  $15+5=20$

d)  $10+A=10+10=20$

e)  $10-2=8$

f)  $B-3=11-3=8$

7) a)  $10000-7583=2417$

$7583_{(16)} = 0111\ 0101\ 1000\ 0011_{(2)} \rightarrow 7583_{(16)} \text{ in } 3A7D_{(16)}$

$1000\ 1001\ 0011\ 1100_{(2)} = 1000\ 1001\ 0011\ 1100_{(2)}$

$1000\ 1001\ 0011\ 1101_{(2)} = 8A7D_{(16)}$

min. num. complement here

b)  $000F095D_{(16)} = 0000\ 0000\ 0000\ 1111\ 0000\ 1001\ 0101\ 1101_{(2)}$

$000F095D_{(16)} = 0000\ 0000\ 0000\ 1111\ 0000\ 1001\ 0101\ 1101_{(2)}$

$1111\ 1111\ 1111\ 0000\ 1111\ 0110\ 1010\ 0010_{(2)}$

$1111\ 1111\ 1111\ 0000\ 1111\ 0110\ 1010\ 0010_{(2)} = FFF0F6A3$

$\therefore$  min.  $000F095D_{(16)}$  &  $FFF0F6A3_{(16)}$  min. num. complement

c)  $4BA1_{(16)} = 0100\ 1011\ 1010\ 0001_{(2)}$

$4BA2_{(16)} = 0100\ 1011\ 1010\ 0001_{(2)}$

min. num. complement

$4BA1_{(16)} = 0100\ 1011\ 1010\ 0001_{(2)}$

$1011\ 0100\ 0101\ 1110_{(2)}$

$0000\ 0000\ 0000\ 0001_{(2)}$

$1011\ 0100\ 0101\ 1110_{(2)} = B45F$



$$d) \quad 7F(16) = \begin{array}{r} -1-1 \\ 100- \\ 715 \\ \hline 81 \end{array}$$

Nr.  $7F(16)$ , si  $81(16)$  sunt complementare.

$$7F(16) = 0111.1111(2)$$

$$\begin{array}{r} 111111 \\ 1000.0000+ \\ 0000001 \\ \hline 0111.1111 \\ 1000.0001 = 81(16) \end{array}$$

$$e) \quad 732A(16) = \begin{array}{r} -1-111 \\ 10000- \\ 73210 \\ \hline 8CDB(16) \end{array}$$

Nr.  $732A(16)$ , si  $8CDB(16)$  sunt complementare.

$$732A(16) = 0111.0010.0010.1010(2)$$

$$\begin{array}{r} 1000.1100.1101.0101+ \\ 0000.0000.0000.0001 \\ \hline 1000.1100.1101.0110 = 8CDB(16) \end{array}$$

8) a)  $8(10) = 10(16) = 0000.0010(2)$   
 b)  $67(10) = 0100.0011(2)$

$$\begin{array}{r} 67 \quad | \quad 2 \\ 66 \quad | \quad 33 \quad | \quad 1 \\ \hline 1 \quad | \quad 16 \quad | \quad 8 \quad | \quad 2 \\ \hline 0 \quad | \quad 8 \quad | \quad 4 \quad | \quad 2 \\ \hline 0 \quad | \quad 4 \quad | \quad 2 \quad | \quad 2 \\ \hline 0 \quad | \quad 2 \quad | \quad 1 \quad | \quad 2 \\ \hline 0 \quad | \quad 1 \quad | \quad 1 \quad | \quad 2 \end{array}$$

c)  $230(10) = 0110.0111(2)$

$$\begin{array}{r} 230 \quad | \quad 2 \\ 230 \quad | \quad 115 \quad | \quad 1 \\ \hline 0 \quad | \quad 56 \quad | \quad 28 \quad | \quad 2 \\ \hline 1 \quad | \quad 28 \quad | \quad 14 \quad | \quad 2 \\ \hline 0 \quad | \quad 14 \quad | \quad 7 \quad | \quad 2 \\ \hline 1 \quad | \quad 7 \quad | \quad 3 \quad | \quad 2 \\ \hline 1 \quad | \quad 3 \quad | \quad 1 \quad | \quad 2 \\ \hline 1 \quad | \quad 1 \quad | \quad 0 \quad | \quad 2 \end{array}$$

1111.1111.1111.1010<sub>(2)</sub>

g) a)  $-6_{(10)} = A_{(16)} = 1010_{(2)}$

$$\begin{array}{r} 10- \\ 6 \\ \hline A \end{array}$$

b)  $-121_{(10)} \text{ EDF}(16) = 1111.1110.1101.1111_{(2)}$

$$\begin{array}{r} 121 \\ -121 \\ \hline 000 \\ 121 \end{array}$$

EDF

c)  $70_{(10)} = 00110001_{(2)} \quad 0000.0000.0011.0001_{(2)}$

$$\begin{array}{r} 70 \overline{) 2} \\ 70 \overline{) 35} \overline{) 2} \\ 0 \quad 35 \overline{) 14} \overline{) 2} \\ \quad 1 \quad 16 \overline{) 8} \overline{) 2} \\ \quad \quad 1 \quad 8 \overline{) 4} \overline{) 2} \\ \quad \quad \quad 0 \quad 4 \overline{) 2} \overline{) 2} \\ \quad \quad \quad \quad 0 \quad 2 \overline{) 1} \overline{) 2} \\ \quad \quad \quad \quad \quad 0 \quad 1 \overline{) 0} \end{array}$$