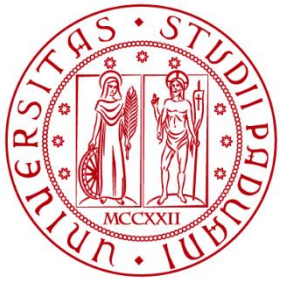
OF THE
DEPARTMENT OF
INFORMATION ENGINEERING



UNIVERSITÀ
DEGLI STUDI
DI PADOVA

Digital Systems

Number Systems, Conversions, Arithmetic, Codes

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Degree Course in Information Engineering

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Exercises

a) Convert from binary to decimal: 1011001
b) Convert from decimal to binary: 3871
c) Convert from hex to binary: E429
d) Convert from decimal to octal: 347
e) Add binary numbers: 10001 + 1111
f) Difference between binary numbers: 10001 - 1111
g) Multiply binary numbers: 10001 x 101
h) Represent the decimal numbers 715 and 354 in BCD
i) Find the even parity code for the following number: 10001
j) Find the odd parity code for the following number: 10001
k) Build the 16-word Gray code

a) $(1011001)_2 = 64 + 16 + 8 + 1 = (89)_{10}$

6 5 4 3 2 1 0

b) $(3871)_{10} \rightarrow (?)_2$

		Remainder
3871 / 2	= 1935	1
1935 | 2	= 967	1
967 | 2	= 483	1
483 | 2	= 241	1
241 | 2	= 120	1
120 | 2	= 60	0
60 | 2	= 30	0
30 | 2	= 15	0
15 | 2	= 7	1
7 | 2	= 3	1
3 | 2	= 1	1
1 | 2	= 0	1

$\Rightarrow (3871)_{10} = (1111\ 0001\ 1111)_2$

c) $(E429)_{16} = (1110\ 0100\ 0010\ 1001)_2$

d) $347_{10} = (?)_8$

$347 / 8 = 43$ Remainder $= 3$

$43 / 8 = 5$ 3

$5 / 8 = 0$ 5

$(347)_{10} = (533)_8$

e)

$$\begin{array}{r} 10001_2 + \\ 1111_2 \\ \hline 100000_2 \end{array} \qquad \begin{array}{r} 17_{10} + \\ 15_{10} \\ \hline 32_{10} \end{array}$$

f)

$$\begin{array}{r} 10001_2 - \\ 1111_2 \\ \hline 00010_2 \end{array} \qquad \begin{array}{r} 17_{10} - \\ 15_{10} \\ \hline 2_{10} \end{array}$$

g)

$10001_2 \times 101_2$

$$\begin{array}{r} 10001 \\ 00000- \\ 10001- \\ \hline 1010101_2 \end{array}$$

$17_{10} \times 5_{10} = 85_{10}$

h) $(715)_{10} = (0111\ 0001\ 0101)_{BCD}$

$(354)_{10} = (0011\ 0101\ 0100)_{BCD}$

i) $10001 \longrightarrow$ even parity : $\underline{0}\,10001$

j) $10001 \longrightarrow$ odd parity : $\underline{1}\,10001$

k)

HEX	BIN	GRAY
0	0000	0000
1	0001	0001
2	0010	0011
3	0011	0010
4	0100	0110
5	0101	0111
6	0110	0101
7	0111	0100
8	1000	1100
9	1001	1101
A	1010	1111
B	1011	1110
C	1100	1101
D	1101	1011
E	1110	1001
F	1111	1000