DW N° 1
NUMBER SYSTEMS AND INFORMATION REPRESENTATION

Exercise 1

Give the polynomial forms of the following numbers:

$42653_{(10)}$ $526{,}649_{(10)}$ $653{,}24_{(9)}$ $2AEF8_{(16)}$

Exercise 2

Find the decimal equivalents of the largest numbers that can be written with 5 digits (a4, a3, a2, a1, a0) = N, in base systems B = 10, 8, 3, 2.

Exercise 3

1. Convert the following binary numbers to decimal numbers :
   1011011 100000 111110 11111111
2. Convert the following numbers to decimal:
   $N_1 = 10111010_{(2)}$ $N_2 = 11101101_{(2)}$
   $N_3 = 745_{(8)}$ $N_4 = 376_{(8)}$
   $N_5 = C7A_{(16)}$ $N_6 = FAC_{(16)}$
3. Convert the following decimal numbers to binary:
   $N_1 = 98$ $N_2 = 453$ $N_3 = 3459$
4. Convert the following decimal numbers to octal:
   $N_1 = 443$ $N_2 = 7528$ $N_3 = 3691$
5. Convert the following decimal numbers to hexadecimal:
   $N_1 = 5664$ $N_2 = 45935$ $N_3 = 1968$

Exercise 4

1. Convert the following octal numbers to binary:
   $365_{(8)}$ $7164_{(8)}$ $6415_{(8)}$
2. Convert the following hexadecimal numbers to binary:
   $BEF_{(16)}$ $2BCD_{(16)}$ $9D5FE_{(16)}$

Exercise 5

Calculate the binary equivalent of the following decimal numbers via base 8:

7777 8888 9562 3895

Exercise 6

Convert the following numbers to binary:

$228{,}375_{(10)}$ $93{,}75_{(10)}$ $345{,}125_{(8)}$ $1AE{,}FDC_{(16)}$ $378F{,}B4_{(16)}$

Exercise 7

1. How many bits are needed to encode the following numbers in binary and in BCD ?
   9 31 32 33 1045
2. Convert the following numbers to binary then to BCD 8421:
   24 1000 512
3. Convert the following numbers to binary then to BCD 6311:
   24 1000 512
4. Convert the following BCD 8421 numbers to decimal numbers:
   1001 0001 0011 1000 0110 1010

Exercise 8

Carry out the following operations in base 2:

1 + 1 =
11 + 10 =
10111010 + 11101101 =
111011 – 10010 =
101101011 – 11011 – 10101 =

Exercise 9

Perform the following operations:

$562_{(8)} + 743_{(8)}$ = $654_{(8)} - 375_{(8)}$ = $734_{(8)} * 652_{(8)}$ =
$7FE_{(16)} + 3AB_{(16)}$ = $AC6_{(16)} - 9DB_{(16)}$ = $6AF_{(16)} * 325_{(16)}$ =

Exercise 10

Knowing that we have 6 bits, using 2's complement, give the binary expressions of the following numbers:

– 24 – 31 – 15 – 4 –12

Same question using 1's complement

Exercise 11

Perform the following operations using 2's complement (n = 4 bits):

+ 5	– 5	– 3	– 5
– 6	+ 6	– 4	– 6
=	=	=	=

Exercise 12

Perform the following operations using 1's complement (n = 4 bits):

+ 5	– 5	– 5
– 6	+ 6	– 6
=	=	=

Exercise 13

Perform the following operations in the BCD code 8421:

5 + 7 = 9 + 9 =

12 + 93 = 129 + 89 =

229 – 177 = 345 – 67 =

Exercise 14

Convert into Gray code (reflected binary) the following binary numbers:

11011 11100100010

Exercise 15

Convert the following Gray code (reflected binary) numbers to binary:

10111 101100111

Exercise 16

Give the floating-point simple-precision representation of the following numbers:

128 – 32,75 18,125 0,0625

Exercise 17

Give the floating-point double-precision representation of the following numbers:

1 – 64 12,06640625 0,2734375

Exercise 18

Give the decimal representation of the following floating-point, single-precision, coded numbers:

1011 1101 0100 0000 0000 0000 0000 0000_2

0101 0101 0110 0000 0000 0000 0000 0000_2

1100 0001 1111 0000 0000 0000 0000 0000_2

0000 0000 0100 0000 0000 0000 0000 0000_2

Exercise 19

Give the decimal representation of the following floating-point, double-precision, coded numbers:

403D 4800 0000 0000_{16} = 0100 0000 0011 1101 0100 1000 0000……0

C040 0000 0000 0000_{16} = 1100 0000 0100 0000……0

BFC0 0000 0000 0000_{16} = 1011 1111 1100 0000……0