Assignment N° 1

Introduction and numeral systems

Questions: Explain the following concepts: computer science, information, computer, Bit, Byte, weight of bits, Hertz, bandwidth (broadband speed) Bit p/second, bps, binary number, the most significant bit and the least significant bit of a number, numeration system, octal and hexadecimal number, microprocessor, ALU, control unit, central memory, operating system.

Exercise 1:

1. How many bytes are 32 bits?
2. In the following byte: $(10001101)_2$, what is the most significant bit and the least significant bit?
3. How many values can we represent using 1 Byte, and in 10 bits?
4. What is the minimum number of bits required to represent numbers between 0 and 4096?
5. Complete the following table. The decimal numbers are unsigned:

Decimal	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Octal																
Hexadecimal																
Binary																

Exercise 2 :

1. Convert the following numbers to base 10:
   $(562)_8$, $(110111)_2$, $(3EB8)_{16}$, $(3213.13)_4$, $(1101.1101)_2$
2. Convert the decimal number X= 327 to base 2, 7, 8, and 16.
3. Convert the decimal numbers X=54.8125 and Y=15.210 to binary system.
4. Consider the number Y = $(11010110101)_2$, Convert the number Y directly to base 4, 8, 16 without passing by the base 10.
5. Convert directly to base 2 (do not use the division procedure) the numbers: X = $(1323)_4$, Y= $(3765)_8$, Z= $(AB1F9)_{16}$.

Exercise 3 :

1. Perform (carry out) the following arithmetic operations:
   - base 8 : 132 + 134 ; 132+ 316 ; 337-155
   - base 16 : F2C + 4C3 ; F2C – 45E
   - base 2 : 100101+101 ; 11011 + 1011 ; 1011101 - 10111
2. Perform the following binary arithmetic operations (base 2) :
   - 10101101 * 1000 ; 101011110 * 101 ; 10111011 * 1101
   - 10101101 ÷ 10 ; 101011110 ÷ 110 ; 10111011 ÷101

Exercice 4 :

1. Achieve the following conversions:
   - 64 bytes = ……..bits
   - 2 Terabyte = ……Gigabyte=……. Megabyte
   - 4,7 Gbyte = …… Mbyte = ……..... Kbyte = ……bytes
   - 512 Kbit/s = …….. Kbyte/s = …….bytes/s.
   - 2,4 GHz = …… MHz =…….. Hz
2. What is the necessary time to download a file of 1 Megabyte using a network of 1 Mbit/s ?

Exercise 5:

Given the numbers A, B et C : A= $(7365)_8$, B=$(2DB,5)_{16}$, C=$(101110100110,1001)_2$

3. Convert A to base 16 and convert B to base 8 without using the base 10?
4. Convert C to base 8 without passing by the base 10?
5. Perform the operation B+C, in base 2 ?
6. Compute the following operation A+C, in base 8 ?
7. Calculate the number B+C et A+C in base 10 ?
8. carry the following operation A+B, in base 16, and in base 8 ?

Exercise 6:

1. Represent the decimal numbers X, Y, Z in base a (a is an integer: a>1)
   X= a, Y= a^2, Z=a^3.
2. Consider the decimal number D= $4a^5 + 2a^3 + a + 5$, such as: a is an integer (a>5). Represent D in base a.
3. Give the 5 integer numbers following $(7FC)_{16}$

Exercise 7 : Carry the following transformations:

1- $(2019)_{10}$ = (?)$_2$; $(269)_{10}$ = (?)$_2$;
2- $(1011001111101)_2$ = (?)$_8$ = (?)$_{10}$ = (?)$_{16}$
3- A= $(2AE62)_{16}$ = (?)$_8$; B=$(6571)_8$ = (?)$_{16}$
4- Realize the following operation A+B, A-B, in base 16, in base 8 and in base 2 ?

Exercise 8 : Do the following conversions:

1. Base 10 to base X : $(69)_{10}$ = (…….)$_7$ $(145)_{10}$ = (…….)$_2$ (251)10 = (……)$_{16}$
2. Base X to base 10 : $(243)_6$ = (…….)$_{10}$ $(1453)_8$ = (…….)$_{10}$ $(324)_5$ = (…….)$_{10}$
3. Base 2 to base 8 : 110100 , 10011101 , 11010100
4. Base 8 to base 2 : 26 , 150 , 1734
5. Base 2 to Base 16 : 11011000 , 100101011100 , 101010101
6. Base 16 to Base 2 : 4BF , 6C2 , A6E

Knowing is not enough; we must apply. Willing is not enough; we must do.

To appreciate the beauty of a snow flake, it is necessary to stand out in the cold.

Try and fail, but don't fail to try.