Series of guided exercises. N° 1 (Number Systems)

Exercise 1 :

1. Count up to 20 in binary, indicating the equivalent decimal value.

2. Represent the following numbers in binary, octal, and hexadecimal:

    $(3114)_{10}$, $(812)_{10}$, $(564)_{10}$, $(83)_{10}$, $(128)_{10}$, $(1000)_{10}$, $(17)_{10}$, $(4448)_{10}$, $(7)_{10}$, $(99)_{10}$.

3. Provide the decimal value of the following numbers.: $(110101001)_2$, $(1367)_8$, $(1402)_5$, $(1993)_{11}$, $(1907)_{16}$, $(11111111)_2$.

Exercise 2:

1. What is the range of natural numbers that can be encoded using N bits?

2. Encode the following natural numbers (given in base 10) using 8 bits (if possible): 3, 127, 215, 2948, 88.

3. Encode the following natural numbers (given in base 10) using 16 bits (if possible): 129, 333, 128, 3680.

Exercise 3 :

1. Represent the numbers. $(681.1875)_{10}$, $(279.25)_{10}$ et $(119.625)_{10}$ in the number bases 2, 8 et 16.

2. Represent the numbers. $(1101.10111)_2$, $(1312.01)_8$, $(A8.1)_{16}$ in base 10.

Exercise 4 :

1. What is the interval of Signed Magnitude Representation that can be encoded using N bits?
2. What interval of one's complement representation can be encoded using N bits?
3. What interval of two's complement representation can be encoded using N bits?
4. Use the SMR, C1, C2 encoding to represent the following signed integers in 8 bits (given in base 10). +22, –16, +114, -130, +67, -99, +32767.

5. Provide the decimal representations of the following binary numbers encoded in C2: (00110101) on 8 bits, (0111010110001101) (on 16 bits).

Exercise 5 :

1- Encode the following real numbers (represented in base 10) in IEEE 754 single-precision floating-point representations.:

-15.6875

+18,625

2- Consider the 2 numbers encoded according to the IEEE 754 standard and represented in hexadecimal: 3EE00000 and BEE00000, provide the corresponding real numbers, what do you notice?

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