USTHB FI 2024-2025
1st Year Computer Science.
Module: STRM1

Series N°1

Exercise N°1:

Complete the following table:

Decimal	Binary	Octal	Hexadecimal
85			
	1101		
			5D
		13.5	
	10011,11101		
			B27, D09
89,0625			
	10101010101		

Exercise N°2 :

1. Let A=$(257)_{10}$
   a) Is there a base system X such that: A= $(230)_x$?
   b) Is there a base system Y such that: A= $(145)_y$?
2. Write in base 4 the number written in base 16 as $(A2B1)_{16}$ without converting it to base 10.
3. Find the base such that :
   $(41)_X = ((14)_5)^2$

Exercise N°3:

- Perform the following operation in the base 16.

A43C+5BCD ; 2345+54EB ; 9F4B - BFFF; B53C-5ECD

Exercise N°4 :

1. Give the two's complement (C2) representations of the following decimal numbers.
   - $(122)_{10}$ on one byte.
   - $(2025)_{10}$ on 16 bits. Can we encode it on eleven bits?
   - $(-78)_{10}$ on two bytes.
   - $(-700)_{10}$ on two bytes.
2. Give the decimal representations of the following binary numbers coded in 2's complement.
   - (00110101) (coded on one byte) .
   - (0111010110001101) (coded on double-byte) .
   - (10100110) (coded on one byte).

Exercise N°5 :

1. Perform the following additions of the relative numbers (represented in C2):

a) 0110 1011 + 1011 1101 b) 1001 0110 + 1111 1011 c) 0110 1111 + 0001 1001 d) 1000 0010 + 1010 1011

Check the decimal results. State the overflow and carry. What conclusions can you draw?

2. Perform the following operations using C2 with 5 bits (study overflow cases).

a) +9+8 b) -7-13 c) +15-1 d) -15+1

3. Give the translation to which the hexadecimal-coded word 8A50 corresponds, depending on whether it is read as :

- A signed integer

- An integer represented in 2's complement.

4. Perform the following operations on 12 bits (including the sign bit), with negative numbers represented in two's complement (condensed form in octal and hexadecimal). Specify whether overflow occurs.

a) $(205)_8$ - $(8F5)_{16}$ = ? b) $(84F)_{16}$ - $(0F5)_{16}$ = ?

Exercise N° 6 :

1) Express the number $(753)_8$ in the following codes:

- Gray code
- BCD code

2) Let A = $(1110111)_{gray}$ and B = $(110010)_{gray}$

a. Give the natural binary value of A and B
b. Perform the two's complement operation C= - A - B on 8 bits. Indicate whether there is an overflow or not.

Exercise N° 7

1. Convert the decimal number 8.625 to floating point according to the IEEE 754 standard.
2. Calculate the decimal value of the number N represented in floating point according to the IEEE 754 standard.

N = 40D00000 (coded in hexadecimal)

Exercise N° 8

- We have a machine where numbers are represented on 32 bits according to the IEEE 754 standard.
  a) Represent the following numbers on the machine:

$$N1 = (13,75)_{16} \quad , \quad N2 = (5,412)_8$$

  b) Calculate N1+N2, represent it on the machine and express it in hexadecimal.

Exercise N°9:

1/ In ASCII code, $(41)_{16}$ is 'A' and $(30)_{16}$ is '0'. Without using the ASCII code table, deduce the encoding of the following message: STRM1

2/ Decode the following message: 57 45 4C 43 4F 4D 45 20 49 4E 20 43 4F 4D 50 55 54 45 52 20 53 43 49 45 4E 43 45

Exercise 10: (final exam 23/24)

Let the following variables be condensed into hexadecimal:

1. Knowing that **A** is coded in pure binary, **B** is coded in 8-bit 2's complement, **C** is coded in Gray, **D** is coded in SVA and **E** is coded in IEEE 754 floating point, give the decimal values of **A, B, C, D** and **E**.
2. Calculate **-B+C** in 2's complement on 8 bits. Indicate the carry and the overflow.
3. Calculate **E+A** on IEEE 754 floating point and represent the result on binary condensed in base 16.

Variables	Values (base 16 condensed)
A	1A
B	BC
C	55
D	D9
E	C19A0000