University of Guelma

Computer Science Department Module: Machine Structure

1st-year Computer Science Engineer Academic year: 2024/2025

Serie of Tutorial Works N° 1

Exercise 01:

- 1. Express the following decimal numbers in binary, octal, and hexadecimal: 316; 201.375; 102.75; 45.20
- 2. Convert the following numbers to decimal, with the base indicated in subscripts: $(AD9.C)_{16}$; $(27.25)_8$; $(11010.0101)_2$
- 3. Calculate the octal equivalent of the following numbers: $(B4D.8)_{16}$; $(110101111.01110)_2$
- 4. Calculate the hexadecimal equivalent of the following numbers: $(437.5)_8$; $(100110011.110011)_2$

Exercise 02:

Perform the following arithmetic operations in binary:

- 1. $(11110110)_2 + (10110111)_2$; $(100111.11)_2 + (101100)_2 + (1101.01)_2$
- 2. (1111101)2-(1001111)2; (1101011.11)2-(101110.10)2
- 3. $(11101)_2 \times (110)_2$; $(101.01)_2 \times (11.11)_2$
- 4. $(1111001111)_2 \div (1101)_2$; $(11101111111.11)_2 \div (1011)_2$

Exercise 03:

Perform the following conversations:

- $(2024)_{10}=(?)_{BCD}$; $(15)_{10}=(?)_{BCD}$.
- $(10101110)_{BCD}=(?)_{10}; (100010000111)_{BCD}=(?)_{10}.$
- $(110001)_2 = (?)_{Gray}$; $(111001)_2 = (?)_{Gray}$.
- $(10011)_{Gray}=(?)_2; (111001)_{Gray}=(?)_2.$

Exercise 04:

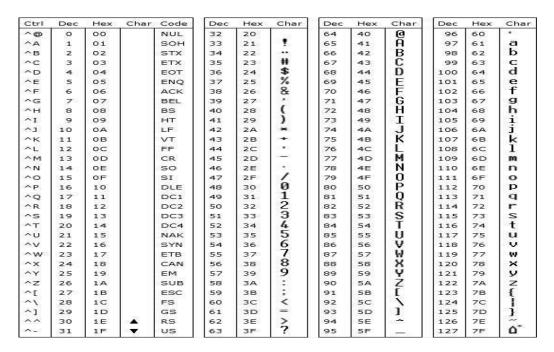
- 1. Encode the following decimal numbers in 8-bit representation with a signed magnitude representation, then in 1's Complement and 2's Complement: +11; -90; -70.
- 2. Indicate, in the four cases below, the values coded by the following sequences: 10010001; 01011100.
 - An unsigned integer.
 - A Signed magnitude integer.
 - A 1's complement signed integer (C1).
 - A 2's complement signed integer (C2).
- 3. Perform the following additions in 2's complement: $(104)_{10} + (-65)_{10}$; $(-104)_{10} + (-5)_{10}$;

Exercise 05:

- 1. Encode the following real numbers on 32 bits according to the IEEE 754 single precision standard (express results in hexadecimal): +45; -32.25; +13.5.
- 2. Convert the following numbers (written in IEEE 754 single precision) to decimal: (40F00000)₁₆; (C3B00000)₁₆;

Exercise 06:

- 1. Using the ASCII table below, convert the word "Guelma" to binary.
- 2. Using the ASCII table below, convert the following binary-coded message into a word: 1001100 1100101 1101101 1101111 1101110



Test your knowledge: Supplementary exercise

To test your knowledge acquisition degree, you can answer the following exercise and send the solution by email to lafifiencadrement@gmail.com

Exercise 01: (4 pts) Final exam: 2023/2024

- 1. Codify the following decimal numbers in 8-bit representation with signed magnitude representation, then in 1's and 2's Representation: +44; -39.
- 2. Codify the following real numbers on 32 bits according to the IEEE 754 single precision standard (express results in hexadecimal): -8,375; +11,625.
- 3. Convert to decimal the following number written in IEEE 754 single precision: (C18C8000)₁₆.