University of Guelma

Computer Science Department **1st-year Computer Science Engineer**

Module: Machine Structure **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. $(11101)_2$ x $(110)_2$; $(101.01)_2$ x $(11.11)_2$
4. $(1111001111)_2$÷ $(1101)_2$; $(1110111111.11)_2$ ÷ $(1011)_2$

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

Ctrl	Dec	Hex	Char	Code
^@	0	00		NUL
^A	1	01		SOH
^B	2	02		STX
^C	3	03		ETX
^D	4	04		EOT
^E	5	05		ENQ
^F	6	06		ACK
^G	7	07		BEL
^H	8	08		BS
^I	9	09		HT
^J	10	0A		LF
^K	11	0B		VT
^L	12	0C		FF
^M	13	0D		CR
^N	14	0E		SO
^O	15	0F		SI
^P	16	10		DLE
^Q	17	11		DC1
^R	18	12		DC2
^S	19	13		DC3
^T	20	14		DC4
^U	21	15		NAK
^V	22	16		SYN
^W	23	17		ETB
^X	24	18		CAN
^Y	25	19		EM
^Z	26	1A		SUB
^[	27	1B		ESC
^\	28	1C		FS
^]	29	1D		GS
^^	30	1E	▲	RS
^-	31	1F	▼	US

Dec	Hex	Char
32	20	
33	21	!
34	22	"
35	23	#
36	24	$
37	25	%
38	26	&
39	27	'
40	28	(
41	29	)
42	2A	*
43	2B	+
44	2C	,
45	2D	-
46	2E	.
47	2F	/
48	30	0
49	31	1
50	32	2
51	33	3
52	34	4
53	35	5
54	36	6
55	37	7
56	38	8
57	39	9
58	3A	:
59	3B	;
60	3C	<
61	3D	=
62	3E	>
63	3F	?

Dec	Hex	Char
64	40	@
65	41	A
66	42	B
67	43	C
68	44	D
69	45	E
70	46	F
71	47	G
72	48	H
73	49	I
74	4A	J
75	4B	K
76	4C	L
77	4D	M
78	4E	N
79	4F	O
80	50	P
81	51	Q
82	52	R
83	53	S
84	54	T
85	55	U
86	56	V
87	57	W
88	58	X
89	59	Y
90	5A	Z
91	5B	[
92	5C	\
93	5D	]
94	5E	^
95	5F	_

Dec	Hex	Char
96	60	`
97	61	a
98	62	b
99	63	c
100	64	d
101	65	e
102	66	f
103	67	g
104	68	h
105	69	i
106	6A	j
107	6B	k
108	6C	l
109	6D	m
110	6E	n
111	6F	o
112	70	p
113	71	q
114	72	r
115	73	s
116	74	t
117	75	u
118	76	v
119	77	w
120	78	x
121	79	y
122	7A	z
123	7B	{
124	7C	|
125	7D	}
126	7E	~
127	7F	⌂

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 : $(C18C8000)_{16}$.