

UNIT 2.

FUNCTIONAL ELEMENTS OF A COMPUTER

Activities-3

Computer Systems
CFGs DAW

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Nomenclatura

A lo largo de este tema se utilizarán distintos símbolos para distinguir elementos importantes dentro del contenido. Estos símbolos son:



Importante



Atención



Interesante

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(Exercise 1) We have a hypothetical computer with this instruction set. Each character in the instruction field corresponds to a bit.

Code	Instruction	Description
LOAD RX, MMMM	00rxmmmm	Loads content of memory <i>mmmm</i> in Register <i>rx</i>
STORE MMMM, RX	01rxmmmm	Stores content of Register <i>rx</i> in memory <i>mmmm</i>
ADD RX, RY	1000rxry	Performs $rx+ry$ and sends the result to the register R3
SUB RX, RY	1100rxry	Performs $rx-ry$ and sends the result to the register R3
JNZ MMMM	1111mmmm	If the content of R3 is not zero the PC jumps to memory <i>mmmm</i>

The memory has the following information (numbers are in binary representation):

Address	Content
0000	
0001	
0010	
0011	00001100
0100	00001001
0101	00001101
0110	00001000
0111	
1000	
1001	
1010	
1011	
1100	
1101	
1110	
1111	

And the following instructions of a program to be executed (numbers are in decimal representation)

```


i1: LOAD R0, 3
i2: LOAD R1, 4
i3: ADD R0, R1
i4: STORE 10, R3
i5: LOAD R0, 5
i6: LOAD R1, 6
i7: SUB R0, R1
i8: JNZ 14 (i10) // memory address 14 stores instruction 10
i9: STORE 7, R3
i10: STORE 8, R3

```

- a) Execute each instruction and update the values of registers and memory addresses and its content. For example, for the first instruction:

i1: R0 → 00001100 (8_{10})

No memory addresses/content updated

- b) Convert each instruction to binary representation. 
- c) Modify the content of address 0110 to store 00001101. Has this update any effect on the execution of the program?
- d) Create a new instruction that adds an integer to the content of a register. You must use 8 bits at maximum.