### Computer Systems – Activity 2 solution

# UD 02. FUNCTIONAL ELEMENTS OF A COMPUTER

Computer Systems
CFGS DAW

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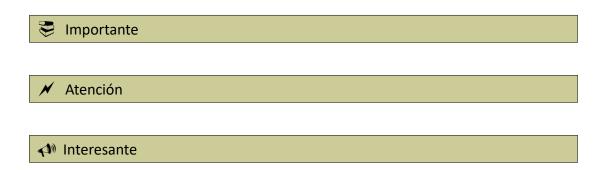
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#### Nomenclatura

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



## UD02. FUNCTIONAL ELEMENTS OF A COMPUTER Activity 2. Solution

#### 1. ACTIVITY 2

| Memory |   |   |   |   |   |   |   |   |  |    |   |   |   |   |   |   |   |   |
|--------|---|---|---|---|---|---|---|---|--|----|---|---|---|---|---|---|---|---|
| 0      |   |   |   |   |   |   |   |   |  | 16 |   |   |   |   |   |   |   |   |
| 1      |   |   |   |   |   |   |   |   |  | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 2      |   |   |   |   |   |   |   |   |  | 18 |   |   |   |   |   |   |   |   |
| 3      |   |   |   |   |   |   |   |   |  | 19 |   |   |   |   |   |   |   |   |
| 4      |   |   |   |   |   |   |   |   |  | 20 |   |   |   |   |   |   |   |   |
| 5      |   |   |   |   |   |   |   |   |  | 21 |   |   |   |   |   |   |   |   |
| 6      |   |   |   |   |   |   |   |   |  | 22 |   |   |   |   |   |   |   |   |
| 7      |   |   |   |   |   |   |   |   |  | 23 |   |   |   |   |   |   |   |   |
| 8      |   |   |   |   |   |   |   |   |  | 24 |   |   |   |   |   |   |   |   |
| 9      |   |   |   |   |   |   |   |   |  | 25 |   |   |   |   |   |   |   |   |
| 10     |   |   |   |   |   |   |   |   |  | 26 |   |   |   |   |   |   |   |   |
| 11     | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |  | 27 |   |   |   |   |   |   |   |   |
| 12     | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |  | 28 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 13     | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |  | 29 |   |   |   |   |   |   |   |   |
| 14     |   |   |   |   |   |   |   |   |  | 30 |   |   |   |   |   |   |   |   |
| 15     |   |   |   |   |   |   |   |   |  | 31 |   |   |   |   |   |   |   |   |

| Registers |   |   |   |   |   |   |   |   |  |  |
|-----------|---|---|---|---|---|---|---|---|--|--|
| 0         | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |  |  |
| 1         | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |  |  |
| 2         | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |  |  |
| 3         | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |  |  |

00001011 Write in memory position 11

(A) [01010101] Write 1

00001100 Write in memory position 12

(B) [00100001] Write 2

00010001 Write in memory position 17

(C) [00000010] Write 3

00011100 Write in memory position 28

(D) [00101101] Write 4

01001011 Copy the data from memory position 11 to register 0

**10000100** Copy the data from Register 0 to Register\_1:  $1 \rightarrow \text{in R1}$ 

01011100 Copy the data from memory position 28 to register 0

**10001100** Copy the data from Register 0 to Register\_3:  $4 \rightarrow$  in R3

01010001 Copy the data from memory position 17 to register 0

**10001000** Copy the data from Register 0 to Register\_2:  $3 \rightarrow \text{in R2}$ 

**10111110** Multiply the content of R3 and R2 and write the result in R3  $[3*4] \rightarrow 12$  in R3

10101101 Subtract the content of R3 and R1 and write the result in R3 [12-1]  $\rightarrow$  11 in R3

01001100 Copy the data from memory position 12 to Register\_0

**10001000** Copy the data from Register 0 to Register\_2:  $2 \rightarrow \text{in R2}$ 

**10011110** Add the content of R3 and R2 and write the result in R3  $[2 + 11] \rightarrow 13$  in R3

**01010001** Copy the data from memory position 17 to Register\_0

**10001000** Copy the data from register\_0 to register\_2  $\rightarrow$  3 in R2

11001110 Divide the content of R3 by R2 and write in R3 [13/3] 4 in R3

**10000011** Copy the date from R3 to R0  $\rightarrow$  4 in R0

01101101 Write in memory position 13 the content of Register 0

00101101 Show in the screen the content of memory position 13

#### 1.1 Solution

- a) Formula: ((D\*C)-A+B)/C
- b) 4 (Content of memory position 13)
- c) The state shown in the solution
- **d)** If the PC was initially at 258 and we have executed 21 instructions, the PC will contain the value 279
- e) we have two bits, i. e. 4 registers.