Sistemas Informáticos (Computer Systems)

Unit 01. Activities 02 - Solution

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UD01. ACTIVITIES 02 - SOLUTION

1. EXERCISE 01 - SOLUTION

Memory state:

Memory										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								

Register state:

Registers								
R0	0	0	0	0	0	1	0	0
R1	0	0	0	0	0	0	0	1
R2	0	0	0	0	0	0	1	1
R3	0	0	0	0	0	1	0	0

Instructions explanation:

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 → in R1

01011100 Copy the data from memory position 28 to register 0

10001100 Copy the data from Register 0 to Register_3: 4 → in R3

01010001 Copy the data from memory position 17 to register 0
10001000 Copy the data from Register 0 to Register_2: 3 → in R2
10111110 Multiply the content of R3 and R2 and write the result in R3 [3*4] → 12 in R3
10101101 Subtract the content of R3 and R1 and write the result in R3 [12-1] → 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 → in R2
10011110 Add the content of R3 and R2 and write the result in R3 [2 + 11] → 13 ¡n R3
01010001 Copy the data from memory position 17 to Register_0
10001000 Copy the data from register_0 to register_2 → 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 → 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

Solution to questions:

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.