FCR. Parcial II. 2021

Each incorrect, illegible or blank answer does not add neither subtracts any point.

1❑ (1 point) Translate the following C++ code to the language of the CT. Variable t is stored in register r2 and the vector vector is stored from address 9816h.

```
int t = -5;

vector[2] = t - vector[2];
```

Write the instructions required, taking into account that r3 already has the value 2 and register r4, the value 9816h.

2❑ (1 point) We have the following C++ code:

```
if (g <= (b - d))
    g = g - b; // g = g - b
else
    g = d;
```

Taking into account that variables g, b and d are unsigned ints and are stored in registers r2, r4 and r0, respectively, translate the code to the language of the CT.

4❑ (1 point) We have the following C++ code:

```
z1 = MyFunc(x1, y1);
```

Translate the code to the language of the CT taking into account that the z1 variable is stored in memory at address 823Ch; the x1 variable is stored in register r3; the y1 variable is stored in register r1; parameters are passed in the stack from right to left; and the function returns the result in register R0.

3❑ (1 point) We have the following C++ code:

```
unsigned int d = 63;
unsigned int p = 0;
do
{
    p = p + 1;
} while (d == p);
```

Taking into account that variable d is stored in r0 and variable p is stored in r2, translate the code to the language of the CT.

5❑ (2 points) We have the following C++ function:

```
unsigned int Equal (unsigned int& x, unsigned int y)
{
    if (x == y)
        return (x + x);
    else
        return (x & y);
}
```

Translate the function to the language of the CT taking into account that parameters are passed in the stack from right to left (one by reference and the other by value) and that the function returns its value in r0.

6 ❏ We have the following code snippet in the language of the CT:

```
        and r3, r5, r4
loop:
        cmp r1, r2
        brc next
        sub r4, r1, r3
        inc r3
        inc r2
        jmp loop ; --INSTR1--
next:
        not r6
        pop r2 ; --INSTR2--
```

The CT has just finished executing an instruction (not from the code above) and it is going to start executing the previous code. We know the value of the following registers:

R0=0014h   R1=0A47h   R2=0A47h   R3=0113h   R4=FAAEh
R5=0CCDh   R6=0CCDh   R7=AB5Bh   PC=F18Ch   IR=1080h

Remember that the number after 1239h is 123Ah and the number before 1210h is 120Fh.

a — (0.5 points) What is the mnemonic of the instruction just executed?

b — (0.5 points) If the instruction indicated with –INSTR1– was substituted with the instruction JMP there and the label *there* indicated the memory position F189h, what would be the encoding of JMP there? (Answer in hexadecimal.)

c — (0.5 points) When the instruction marked with –INSTR2– is executed, what memory address is accessed after step 4 and before finishing the instruction? (Answer in hexadecimal.)

d — (1 point) Taking into account that the CT clock frequency is 250 GHz, how long does it take to run the previous code? Answer in ns.

7 ❏ (0.5 points) The following instruction has been added to the CT:

Instruction encoding	Mnemonic	Operation
01110 Rd Rs1 Ri 00	SUB Rd, Rs1, [Ri]	Rd ← Rs1 - [Ri]

What would be the encoding of the instruction SUB R1, R4, [R5]? (Answer in hexadecimal.)

8 ❏ (1 point) We want to add a new arithmetic instruction to the CT instruction set with the mnemonic CMP R5, Inm8. This instruction subtracts register R5 minus the constant Imm8 (transformed to 16 bits by extending its sign) and updates the corresponding flags in the status register. Write, using the smallest possible number of steps, the control signals required for this instruction from step 4.

Step	Signals