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Grade:

/15

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15] 1) Write an assembly program that adds the content of Registers R4, R5, and R6 to register R7 then subtract the content of R10 from R7. Once calculation is done all values of aforementioned registers must be saved in memory starting at memory address 0x0200. Use these register values: R4 = 4, R5 = 3, R6 = 10, R10 = 15. The overall program structure should be as follows:

```

Setup      .....      ;clear all registers
           .....      ;Setup Register Values

Addition   .....      ;Add the content of registers
           .....      ;R4,R5,R6 into R7

Subtraction .....      ;subtract content of R10 from R7

Store      .....      ;Store the content of all Register used
           .....      ;into memory including results in the
           .....      ;Order R4, R5, R6, R10, R7.
           .....

Mainloop   jmp      Mainloop      ;Infinite Loop

```

[3] 1.a) complete the above assembly program.

[12] 1.b) Answer the Following Questions:

- [2] Record the values of Register prior to program execution

o R4 0x0004, R5 0x0003, R6 0x000A, R10 0x000F, R7 0x0002, SR 0x0000, NZVC 0000

- [2] Record the values (words) of memory locations starting at location 0x0200

Prior to execution →

Address	0x0200	0x0202	0x0204	0x0206	0x0208	...
Words	1234	5678	9ABC	DEFO	1243	...

- [2] Record the values of Registers after program execution

o R4 0x0004, R5 0x0003, R6 0x000A, R10 0x000F, R7 0x0002, SR 0x0000, NZVC 0000

- [2] Record the values (words) of memory locations starting at location 0x0200

Address	0x0200	0x0202	0x0204	0x0206	0x0208	...
Words	0004	0003	000A	000F	0002	...

- [2] Why do we need an infinite loop at the end of the program?

o So that the code stops and does not pick up unwanted values during execution

- [2] Does the MSP430 Microcontroller support real-time clock? Please explain!

o The MSP430 Microcontroller does support real-time clock using crystal oscillation. The crystal is a unique mineral known for producing a specific wave consistently. Devices like the MSP430 use frequencies to manipulate the timing and pattern of the oscillation to count (or measure) in real time.