Q1 [20 Points]. For the questions below, write the code using the masks that are pre-defined in the header file.
(e.g.,: BIT0 = 0000 0001; BIT1 = 0000 0010; ...; BIT7 = 1000 0000).
Perform the operations below on the 8-bit variable (uint_8t data).

(Part a) Write code that performs the three operations below. Perform each operation independently of the others.
• Set bit 5.
• Clear bit 5.
• Invert bit 5.

(Part b) Write code that performs the three operations below. Perform each operation independently of the others.
• Set bits 2 and 3.
• Clear bits 2 and 3.
• Invert bits 2 and 3.
• Set bit 2 and clear bit 3.

(Part c) Write an if-condition line for each of the cases below. Perform each operation independently of the others.
• Check if bit 4 is 1.
• Check if bit 4 is 0.
• Check if bits 4,5 are 1,1.
• Check if bit 4 is 0 and bit 5 is 1.
• Check if bits 4, 5 are 0,0.

Q2 [25 Points]. A module on the microcontroller is configured using a control register called CTL that has the format shown below.

SLP	CLK	CAP	IE
2 bits	3bits	2bits	1 bit

• SLP: selects sleep mode; value between 0 and 3
• CLK: selects clock speed; value between 0 and 7
• CAP: selects built-in capacitor value; choice between 0 and 3
• IE: interrupt enable bit (1: enable/ 0: disable)

To support programming the device, the environment has declared the symbolic constants:

```
SLP_3:      1100 0000
SLP_2:      1000 0000
SLP_1:      0100 0000
SLP_0:      0000 0000

CLK_7:      0011 1000
CLK_6:      0011 0000
...
CLK_0:      0000 0000

CAP_3:      0000 0110
...
CAP_0:      0000 0000

IE:         0000 0001
```

Perform all the operations below using the masks defined above.

(Part a) Write a line of code that configures the module as the following:
(Sleep mode 3)(Clock speed 4)(Capacitor value 1)(Interrupts enabled)

(Part b) For the operation above, show the masks used and the final value of CTL in binary.

(Part c) Write a piece of code that changes SLP to 1. The current value of SLP is unknown.

(Part d) Write an if-condition line that checks if SLP=3.

(Part e) Write an if-condition that checks if the current value of CLK is either of (0, 2, 4, 6).

Q3 [20 Points]. Answer the following questions regarding memory specification.

(Part a) A memory is byte addressable and has a 18-bit address. All the addresses are valid. What is the total size of the memory?

- (Part c) A memory is byte addressable and has a total size of 17,408 bytes (17 KB). What is the smallest address size that can be used for this memory?

Q4 [20 Points]. Answer the following questions regarding memory specification.

(Part a) A microcontroller's memory map allocates the FLASH code space to the address range [0x0500 to 0x0CFF]. What is the code size, in bytes, that is supported by this microcontroller?

(Part b) The vector table contains memory addresses (a vector is a memory address). In a certain MSP430 device, the vector table is in the range [0xFFC0 to 0xFFFF]. The memory address is 16-bit. How many vectors does this vector table support?

Homework Policies
(I) Homework 1 is due by 11:59PM on Sunday 09/14/2025. Late submissions will be penalized unless prior arrangements have been made with the instructor. The standard late penalty is a 10% deduction for each day late. Assignments more than one week late will not be accepted unless there's an exception (with prior communication with the instructor).
(II) All homework must be submitted electronically (PDF) via Webcourses. Ensure that your file is properly named (e.g., "Lastname_Firstname_EEL4742_HW1.pdf"). If you encounter technical issues during submission, you must notify the instructor before the due date by email.
(III) All submitted work must be your own. Plagiarism, including copying from other students, online sources, or using GPTs, is strictly prohibited. Any instances of plagiarism will result in a zero for the assignment.
(IV) If you believe there has been a grading error, you may request a regrade within one week of receiving your graded assignment.
(V) Remember to show your work for full credit. If you provide only the final answer, you willl earn partial credit.
(VI) For certain assignments, you may be required to attend a check-off meeting (in-person or online) with the instructor after submission. During this meeting, you will discuss your solution, explain your approach, and answer questions about your work. Failure to attend a required check-off meeting, or inability to explain your solution, may result in a reduction of your grade for that assignment.