Experiment 2 – Timer Usage on MSP430

Preliminaries:

1. Students who will attend to this experiment are assumed to know:
   - Usage of basic I/O registers on MSP430
   - Usage of timers on MSP430
2. Study related topics from course slides and the textbook
3. Run example codes from slides and textbook
4. Study datasheets for MSP430 and the launchpad you picked up
5. Always comment your code!!

Work:

- **Basic I/O registers are PxOUT, PxIN, PxREN.**
- **Timers that are going to be used in this experiment are Timer A, Timer B and Watchdog timer.**
- **All three modes of Timer A and B are needed for this experiment.**
- **Interactions with timers will be only by polling in this experiment. You are not responsible for any interrupt related material.**

1. What is a timer in the concept of embedded system design? Give at least three examples of usages for timers.
2. What are the differences between using a timer and using an empty for loop to measure or pass the required amount of time?
3. Is there any difference between Watchdog timer and Timer A(or B)? If so what are the differences?
4. What are the registers used to program timers in your choice of MSP430 kit you obtained for your project?(Emphasize the model of your kit.)
5. How can you reset an MSP430 in software? What are the usages of software reset?(*Hint: Check the course slides.*)
6. Write a code in C with following flow of operation:

- Configure Watchdog timer for timer mode and clear the Watchdog timer counter
- Configure LEDs as outputs on necessary ports
- Select appropriate clock source and interval so that you can generate 1 second intervals.
- Turn on and off the LEDs with 1 second intervals by checking the watchdog timer interrupt flag. Usage of any kind of delay function/loop is FORBIDDEN.
- Run this code on your MSP430 launchpad and show Watchdog timer interrupt flag register value.(You need to read the interrupt flag value manually, you don't need to do any interrupt handling.)

7. Write a code in C with following flow of operation:
   - Configure Timer A to work in up mode
   - Configure Timer A interval to generate 1 second intervals
   - Configure LEDs as outputs on necessary ports
   - Turn on and off the LEDs with 1 second intervals by checking the Timer A interrupt flag. Usage of any kind of delay function/loop is FORBIDDEN.
   - Run this code on your MSP430 launchpad and show Watchdog timer interrupt flag register value.(You only need to read the interrupt flag value manually, you don't need to do any interrupt handling.)
8. Write a code in C that blinks one of the LEDs on your launchpad. Blinking intervals should use Timer A operation similar to the previous question. Usage of any kind of delay function/loop is FORBIDDEN. Blinking pattern should alternate between a short blink and long blink with each cycle, i.e.
   LED is on → Short delay → LED is off → Short delay → LED is on → Long delay → LED is off → Long delay → LED is on → Short delay...

Notes :

- **You should prepare a preliminary work report with the answers of the questions on the "Work" part.**
- **All answers should be in English, it may be better to put your C codes in a Text box for better readability, code parts has to use a Type Writer font like `Courier New`**
- **You should upload your preliminary file as a PDF with all answers and codes inside. Zip, Rar, Word document or any other format than PDF will not be accepted.**
- **Without a proper preliminary work, you cannot participate in experiment!!You will be notified at the start of experiment about sufficiency of your preliminary works.**