Experiment 1 – Basic I/O Usage and Embedded C Programming

Preliminaries:

1. Students who will attend to this experiment are assumed to know:

   · Usage of basic I/O registers on MSP430FG4618 and

   · Usage of arithmetic and logical operators in C Programming Language

   · Creating and running a new MSP430 project on Code Composer Studio

   · Usage of Debugging facilities on Code Composer Studio, e.g. breakpoints, inspecting variable and register values

2. Study related topics from course slides and the textbook

3. Run example codes from slides and textbook

4. Study datasheets for MSP430G4618 and the launchpad you picked up

5. Always comment your code!!

Work:

· **Basic I/O registers are PxOUT, PxIN, PxREN**

· **You should use ˍˍno˙operation() function for debugging purposes when required**

1. What model of launchpad kit you obtained? What was your criteria for choosing that model? What is the model of microcontroller on your launchpad?

2. What happens if you apply "XORing with 1" operation to a variable? How do you "XOR" a variable named **mynumber** and assign the result to the variable itself in C?

3. How do you query the status of a single bit in C for a variable? How about multiple bits (like zeroth and second bits together)? Show each with a single line of code for a variable named **mynumber**. (*Hint: You can use Code Composer macros BIT0, BIT1...*)

4. What is debouncing? Why do we need it? How can you implement a simple debouncing mechanism in software? With the answers of these questions in mind write a code that toggles and LED on your launchpad on and off with the press of the push button.

5. What is pull-up or pull-down for an input or output? How can you implement a pull-down using circuit components? How can you implement pull-up using MSP430 software? (*Hint: Some MSP430 chips have internal pull-up like in MSP430G2553*)

6. Write a code in C with following flow of operation:

   · Create integer variables same as your first name and last name

   · Assign your home town plate number to that variable

   · Write a for loop that shifts the variable to the left four times, it should shift variable only once each iteration

   · Make an aritmetic "AND" operation between your variable and 0x30 hexadecimal value, assign the result to the variable same as your last name

   · Add required other parts of code so that you can debug and see the results in debugger window

   · Run this code on your MSP430 launchpad and show the results of name and surname variables on debugger variables window.

7. Write a code in C that blinks one of the LEDs on your launchpad. 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 <u>will not</u> be accepted.**

· **<u>Without a proper preliminary work, you cannot participate in experiment!!</u>You will be notified at the start of experiment about sufficiency of your preliminary works.**