

## Exercise 1

A basic element of microcontrollers are I/O ports. Depending on the family, microcontrollers feature several general purpose input and output ports. A is thereby a group of (most likely eight) bidirectional I/O pins, which are controlled by a register of the processor. As a microcontroller typically has more peripherals than just logical in- and outputs, these pins have to handle multiplexing, so that different internal peripheral modules share the same pins. By setting dedicated registers, the attribution of a peripheral to the pin is selected.

Within exercise 1, configuring the registers for setting digital I/O ports shall be considered. To do so, the Function-Select-Register (PxSEL) has to be set to yield the correct functionality of the port pin<sup>1</sup>. Then, the pins of the microcontroller's ports have to be configured either as input or as output. Therefore, you have to set the bits in the direction register PxDIR<sup>2</sup>. After having selected the direction, the state of the pin (HIGH or LOW) can be changed by setting the PxOUT register<sup>3</sup>.

### Task 1

- Connect header pin **K3 (LED rt)** with **CON3:P1.4** and make the red LED blink with a frequency of about two Hertz. The duty cycle<sup>4</sup> should approximately yield 50%. (**3 points**.)
- Make the blue LED (connected to **CON3:P1.5**) blink with half of the frequency of the red LED. To do so, select the required pin from the schematic (**2 Pkt.**). Write a comment in your program which also explains the alternate functions of this pin and how they can be activated (**1 point**).
- Every time you receive something from the serial interface, respond by sending a string to the serial interface which contains information about the state of the blue LED. Just use the predefined functions from the given template, which you also find within the documentation.<sup>5</sup> (**3 points**).

*Please also consider page 2.*

<sup>1</sup> see MSP430x2xx Family UserGuide: chapter 8.2.5, S. 329 and data sheet MSP430G2x53 S. 42ff

<sup>2</sup> see MSP430x2xx Family UserGuide: chapter 8.2.3, S. 337

<sup>3</sup> see MSP430x2xx Family UserGuide: chapter 8.2.2, S. 336

<sup>4</sup> Duty cycle = time of high phase  $T$  divided by the period time  $\tau \Leftrightarrow D = \frac{T}{\tau}$

<sup>5</sup> To send and receive data from the serial interface, use a third party tool, e.g. HTerm: <http://www.der-hammer.info/terminal/>

## Task 2

- a) Please generate a file `erfahrungen.txt` with a short feedback on the exercise sheet, i.e. name the challenges you had to face, which additional information should have been provided additionally, and so on. (**1 point**).
- b) Import your text file to the Code Composer Studio project, export the project and upload the file to ILIAS.