Computer Technology I

Lab. 1 : How to use the PORTs, Digital input/output, Subroutine call

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Semester: Autumn 2019
Area: Computer Science
Course code: 1DT301

Contents

1 Task 1

This is the code for the first task :

```
;>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
; 1DT301, Computer Technology I
; Date: 2019-09-09
; Author:
; Loic GALLAND
; Leonardo PEDRO
;
; Lab number: 1
; Title: How to use the PORTs. Digital input/output. Subroutine call.
;
; Hardware: STK600, CPU ATmega2560
;
; Function: Program to light up the LED number 2

; Input ports: NO inputs ports in this Task
;
; Output ports: The portB is used as an output ports
;
; Subroutines: If applicable.
; Included files: m2560def.inc
;
; Other information:
;
; Changes in program: (Description and date)
;
;<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<

.includes "m2560def.inc"
ldi r16, 0xFF
out DDRB, r16

ldi r16 , 0b11111011
out portB, r16
```

2 Task 2

This is the code for the second task :

```
;>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
; 1DT301, Computer Technology I
; Date: 2019-09-09
; Author:
; Loic GALLAND
; Leonardo PEDRO
;
; Lab number: 1
; Title: How to use the PORTs. Digital input/output. Subroutine call.
;
; Hardware: STK600, CPU ATmega2560
;
; Function: Program to light up the LED correponding to the switch. EX:
    (Switch number 1 will light up LED number 1)
```

```
; Input ports: PortA is used as input to get the information from the
    switches
;
; Output ports: The portB is used as an output ports to control the
    LEDs
;
; Subroutines: If applicable.
; Included files: m2560def.inc
;
; Other information:
;
; Changes in program: (Description and date)
;
;<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<

.include "m2560def.inc"
ldi r16, 0xFF           ;Setting up the data direction for Port B
out DDRB, r16           ;Set port B as output

ldi r16, 0x00           ;Setting up the data direction for Port A
out DDRA, r16           ;Set Port A as output

my_loop:                ;Loop to always check which switch is pressed
        in r17,PINA ;Getting the information of which switch is pressed
        out portB, R17  ;Lighting up the corresponding LED
rjmp my_loop
```

3 Task 3

```
;>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
; 1DT301, Computer Technology I
; Date: 2019-09-09
; Author:
; Loic GALLAND
; Leonardo PEDRO
;
; Lab number: 1
; Title: How to use the PORTs. Digital input/output. Subroutine call.
;
; Hardware: STK600, CPU ATmega2560
;
; Function: Program to only light up LED number 0 if the switch number
    5 is pressed. If any other switch is pressed, nothing will happen

; Input ports: The Port A will be used as an input port in this Task
;
; Output ports: The portB is used as an output port
;
; Subroutines: If applicable.
; Included files: m2560def.inc
;
; Other information:
;
; Changes in program: (Description and date)
;
ldi r16, 0xFF           ;Setting up the data direction for Port B
out DDRB, r16           ;Set port B as output
```

```
ldi r16, 0x00           ;Setting up the data direction for Port A
out DDRA, r16           ;Set Port A as output

ldi r16, 0xFF           ;Turn off all the LEDs
out portB, r16

ldi r18, 0b11011111
ldi r19, 0b11111110

my_loop:
        in r17, PINA    ;get the info from the switch
        cp r17, r18     ;compare switch info with desired one
        breq light      ;condition if r17=r18 go to the "light"
rjmp my_loop

light: out portB,r19    ;turns on the LED0
```

4 Task 5

```
;>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
; 1DT301, Computer Technology I
; Date: 2019-09-09
; Author:
; Loic GALLAND
; Leonardo PEDRO
;
; Lab number: 1
; Title: How to use the PORTs. Digital input/output. Subroutine call.
;
; Hardware: STK600, CPU ATmega2560
;
; Function: Create a program that creates a Ring Counter with a delay
    of approximately 0.5 seconds between each step.

; Input ports: NO inputs ports in this Task
;
; Output ports: The portB is used as an output port
;
; Subroutines: A subroutine will be used when creating the 0.5 second
    delay.
; Included files: m2560def.inc
;
;<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<

.includes "m2560def.inc"

; Initialize SP, Stack Pointer
ldi r20, HIGH(RAMEND)   ; R20 = high part of RAMEND address
out SPH,R20             ; SPH = high part of RAMEND address
ldi R20, low(RAMEND)    ; R20 = low part of RAMEND address
out SPL,R20             ; SPL = low part of RAMEND address

ldi r16, 0xFF           ;Setting up the data direction for Port B
out DDRB, r16           ;Set port B as output

ldi r17, 0b11111110     ;Initial LED state
out PortB, r17
```

```
my_loop:
        out portB, r17
        CALL Delay
        com r17
        LSL r17
        com r17
rjmp my_loop

Delay:
;Generated by delay loop calculator
:at http://www.bretmulvey.com/avrdelay.html
;
;Delay 4 050 000 cycles
;500ms at 8.1 MHz

        ldi r18, 21
        ldi r19, 140
        ldi 20, 174
L1:     dec r20
        brne L1
        dec r19
        brne L1
        dec r18
        brne L1
        rjmp PC+1
RET
```

5 Task 6

```
;>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
; 1DT301, Computer Technology I
; Date: 2019-09-09
; Author:
; Loic GALLAND
; Leonardo PEDRO
;
; Lab number: 1
; Title: How to use the PORTs. Digital input/output. Subroutine call.
;
; Hardware: STK600, CPU ATmega2560
;
; Function: Creates a program that creates a Johnson Counter in an
    infinite loop

; Input ports: NO inputs ports in this Task
;
; Output ports: The portB is used as an output port
;
; Subroutines: To be able to use the delay
; Included files: m2560def.inc
;<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<

.includes "m2560def.inc"

; Initialize SP, Stack Pointer
ldi r20, HIGH(RAMEND)    ; R20 = high part of RAMEND address
out SPH,R20              ; SPH = high part of RAMEND address
ldi R20, low(RAMEND)     ; R20 = low part of RAMEND address
```

```
out SPL,R20             ; SPL = low part of RAMEND address

ldi r16, 0xFF   ;Setting up the date direction register for Port B
out DDRB, r16   ;Set port B as output

ldi r16, 0xFF
out portB, r16

ldi r21, 0b11111110     ;Initial LED state
ldi r22, 0xFF   ;When all the LEDs are turned off
ldi r23, 0x00   ;When all the LEDs are turned on

my_loop:
        out portB, r21
        LSL r21
        CALL Delay
        ;Compare the current status of the LEDs to check if they are
           all turned on.
        cp r21, r23
        breq light
rjmp my_loop

light:
        out portB, r23
        CALL Delay
        ldi r21, 0b10000000
        out portB, r21
        Second_loop:
                out portB, r21
                ASR r21
                CALL Delay
                cp r21, r22             ;Compare the current status to
                   know if it needs to start going the other way
                breq my_loop
        rjmp Second_loop

Delay:
;Generated by delay loop calculator
:at http://www.bretmulvey.com/avrdelay.html
;
;Delay 4 050 000 cycles
;500ms at 8.1 MHz

        ldi r18, 21
        ldi r19, 140
        ldi 20, 174
L1:     dec r20
        brne L1
        dec r19
        brne L1
        dec r18
        brne L1
        rjmp PC+1
RET
```