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;>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
;1DT301, Computer Technology I
;Date: 2019-09-17
;
;Author:
;   Student name 1:          Einar van de Velde
;   Student name 2:          Abdulla Mehdi
;
;Lab number:                 2.
;Title:                      Task 1.
;
;Hardware:                   STK600, CPU ATmega2560.
;
;Function:                   Switch between Ring counter and Johnson counter.
;                            Use SW0 (PA0) for the button.
;                            Each time you press the button,
;                            the program should change counter.
;
;Input ports:                PORTA.
;
;Output ports:               On-board LEDs connected to PORTB.
;
;Subroutines:                RING.
;                            JOHNSSON.
;
;Included files:             m2560def.inc
;
;Other information:
;Changes in program:
;        File Created (2019-09-17)
;                Program is runnable (2019-09-17)
;
;<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
.include "m2560def.inc"

; Initialize SP, Stack Pointer (Stack pointer is NOT used)
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                      ;Loads 255 at register 16
out DDRB, r16                      ;Initialize port B

ldi r16, 0x00                      ;Set the Data Direction Register as
                                   ;MINimum (0).
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out DDRA, r16                    ;Set A Port as output Port.

ldi r17, 0b00000001
mov r21, r17
ldi r25, 0b11111111

ldi r22, 0
ldi r23, 0
.def FIRSTTIME = r22
.def SECONDTIME = r23

ldi r29, 0b00001111
ldi r30, 0b11110000

;----------------------------;
;INFINITE LOOP               ;
;----------------------------;
INFINITE:

   FIRST:
      call DELAY
      in r16, PINA
      ldi r26, 0b11111110
      cp r26, r16
      brne NOREACT

   REACT:
      com SECONDTIME
      ldi r17, 0b00000001

   NOREACT:
      mov r16, r17
      com r16
      out PORTB, r16
      cpi SECONDTIME, 0
      brne JOHNSSON

   RING:
      lsl r17
      cpi SECONDTIME, 0
      breq JOHNSSON_END

   JOHNSSON:
      cpi FIRSTTIME, 0xFF
      breq SHIFT_RIGHT

      SHIFT_LEFT:
         lsl r17
         add r17, r21
```

```
            cpi FIRSTTIME, 0xFF
            brne BEGIN_COMPARE

            SHIFT_RIGHT:
               lsr r17

         BEGIN_COMPARE:
            cp r17, r25
            breq EQUAL

         JOHNSSON_END:
            cpi SECONDTIME, 0
            brne RING_END_CONDITION_1
            cpi r17, 0
            brne RING_END_CONDITION_1
            ldi r17, 1

         RING_END_CONDITION_1:

      rjmp FIRST

      EQUAL:
         com r25
         com FIRSTTIME

rjmp INFINITE

;-----------------------------;
;DELAY                        ;
;-----------------------------;
      DELAY:
      ; Generated by delay loop calculator
      ; at http://www.bretmulvey.com/avrdelay.html
      ;
      ; Delay 500 000 cycles
      ; 500ms at 1 MHz


         ldi  r18, 4
         ldi  r19, 138
         ldi  r20, 86
      L1: dec  r20
         brne L1
         dec  r19
         brne L1
         dec  r18
         brne L1
          rjmp PC+1
      ret
```

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