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;1DT301, Computer Technology I
:Date: 2019-10-04
:Author:
 Student name 1:
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 Student name 2:
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;Lab number:
                     4.
                     Task 4.
:Title:
                     STK600, CPU ATmega2560.
;Hardware:
:Function:
                     Program that simulates the rear lights on a car
                     The 8 LEDs should behave like the rear lights.
                     When braking, all LEDs light up, if blink on the
                     right or left is not going on.
                     PORTD.
;Input ports:
Output ports:
                     On-board LEDs connected to PORTB.
                     TURN LEFT.
;Subroutines:
                     TURN RIGHT.
                     INTERRUPT 0.
                     INTERRUPT 1.
                     INTERRUPT 2.
:Included files:
                     m2560def.inc
Other information:
;Changes in program:
     File Created (2019-10-04)
          Program is runnable (2019-10-04)
.include"m2560def.inc"
.org 0x00
rjmp START
.org INT0addr
rjmp INTERRUPT 0
.org INT1addr
rjmp INTERRUPT_1
.org INT2addr
rjmp INTERRUPT_2
.org 0x72
```

START:

```
ldi r20, HIGH(RAMEND)
  out SPH,r20
  Idi r20, LOW(RAMEND)
  out SPL, r20
  ldi r16, 0x00
  out DDRD, r16
  out DDRA, r16
  ldi r16, 0xff
  out DDRE, r16
  out DDRB, r16
  Idi r16, 0b00000111
  out EIMSK, r16
  ldi r16, 0b00001010
  sts EICRA, r16
  sei
MAIN:
  ldi r16, 0xff
  out DDRB, r16
  com r16
  out DDRD, r16
  ldi r24, 1
LOOP:
  cpi r24, 1
  breq NORMAL
  cpi r24, 2
  breq LEFT
  cpi r24, 3
  breq RIGHT
rjmp LOOP
;NORMAL -----
NORMAL:
  ldi r17, 0b00111100
  out PORTB, r17
rjmp LOOP
;LEFT -----
LEFT:
  ldi r17, 0b11101100
  rcall DELAY 1
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```
out PORTB, r17
  ldi r17, 0b11011100
  rcall DELAY_1
  out PORTB, r17
  ldi r17, 0b10111100
  rcall DELAY_1
  out PORTB, r17
  ldi r17, 0b01111100
  rcall DELAY_1
  out PORTB, r17
rjmp LOOP
;RIGHT -----
RIGHT:
  ldi r17, 0b00110111
  rcall DELAY_1
  out PORTB, r17
  ldi r17, 0b00111011
  rcall DELAY_1
  out PORTB, r17
  ldi r17, 0b00111101
  rcall DELAY 1
  out PORTB, r17
  ldi r17, 0b00111110
  rcall DELAY_1
  out PORTB, r17
rjmp LOOP
;delay-----
DELAY 1:
  ldi r20, 255
  ldi r21, 0
  DEL_1:
    rcall DELAY_2
    inc r21
    cp r20, r21
    brne DEL_1
  ret
DELAY 2:
  ldi r22, 255
  ldi r23, 0
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DEL_2:
    inc r23
    cp r22, r23
    brne DEL_2
  ret
;INTERRUT_0 -----
INTERRUPT_0:
  push r16
  in r16, sreg
  push r16
  cpi r16, 0x00
  breq PRESS_0
PRESS_0:
  cpi r24, 2
  brne TURN_RIGHT
  ldi r24, 1
rjmp DONE_1
TURN_RIGHT:
  ldi r24, 2
DONE_1:
  pop r16
  out sreg, r16
  pop r16
reti
;INTERRUPT_1 -----
INTERRUPT_1:
  push r16
  in r16, sreg
  push r16
  cpi r16, 0x00
  breq PRESS_1
PRESS 1:
  cpi r24, 3
  brne TURN_LEFT
  ldi r24, 1
rjmp DONE_2
TURN_LEFT:
  ldi r24, 3
```

```
DONE_2:
  pop r16
  out sreg, r16
  pop r16
reti
;INTERRUPT_2 ------
INTERRUPT_2:
  push r16
  in r16, sreg
  push r16
  cpi r16, 0x00
  breq PRESS_3
PRESS 3:
  cpi r24, 1
  breq NORMAL_1
  cpi r24, 2
  breq LEFT_1
  cpi r24, 3
  breq RIGHT_1
DONE 3:
  pop r16
  out sreg, r16
  pop r16
reti
;NORMAL_1 ------
NORMAL 1:
  ldi r17, 0b00000000
  out PORTB, r17
rjmp DONE_3
;LEFT_1 ------
LEFT_1:
  ldi r17, 0b11100000
  rcall DELAY_1
  out PORTB, r17
  ldi r17, 0b11010000
  rcall DELAY_1
  out PORTB, r17
  ldi r17, 0b10110000
  rcall DELAY_1
```

out PORTB, r17 ldi r17, 0b01110000 rcall DELAY_1

out PORTB, r17 rjmp DONE_3

> out PORTB, r17 ldi r17, 0b00001011 rcall DELAY_1

> out PORTB, r17 ldi r17, 0b00001101 rcall DELAY_1

> out PORTB, r17 Idi r17, 0b00001110 rcall DELAY_1

out PORTB, r17 rjmp DONE_3