



Instituto Tecnológico y de Estudios Superiores de Monterrey
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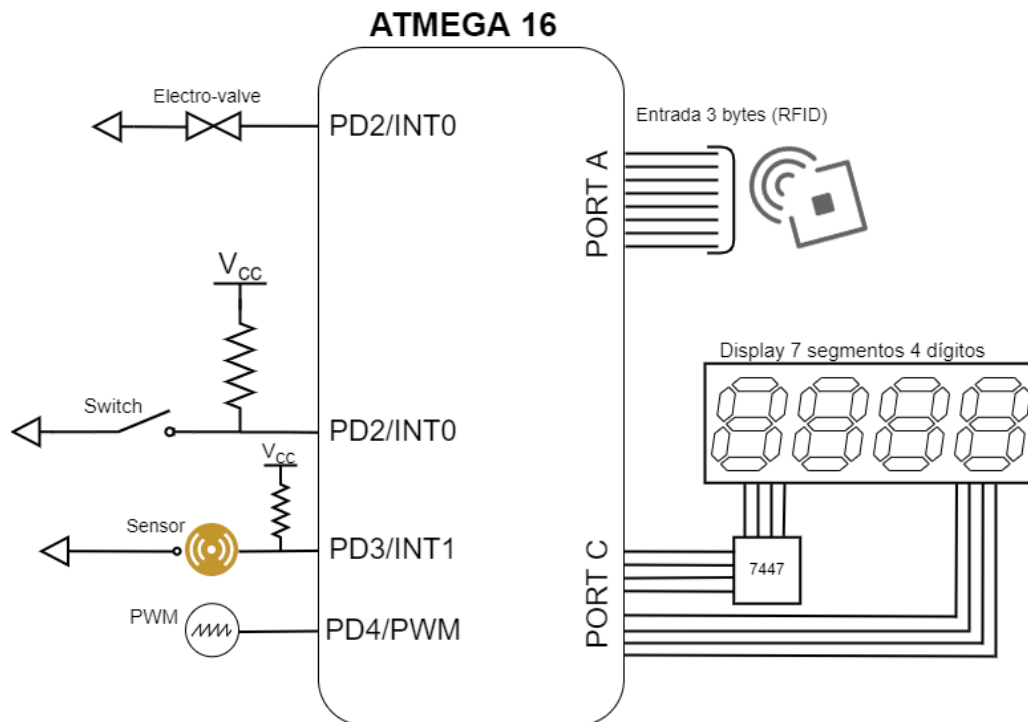
EXAMEN PRÁCTICO 2

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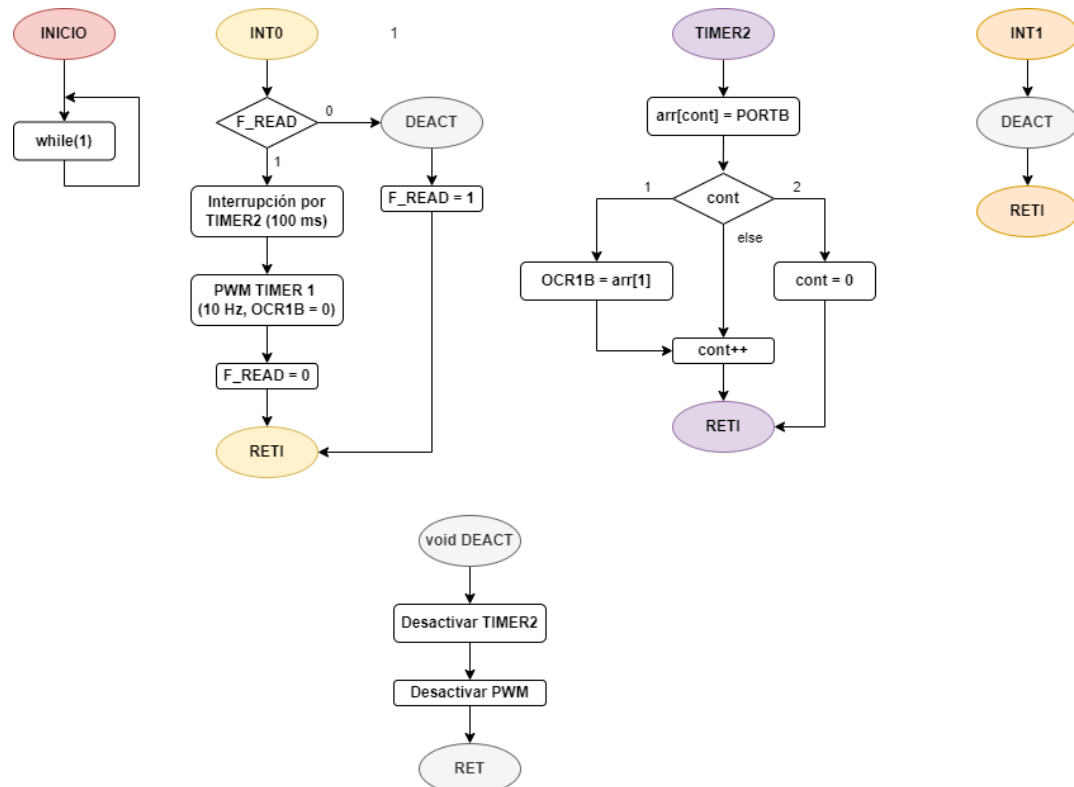
Junio, 2022

Diseño de sistemas en chip

1) Diseño de Hardware:



2) Diagrama de flujo:



3) Código:

```
/
*
* main.c
*
* Created: 6/6/2022 4:43:25 PM
* Author: Robogod
*/

#define F_CPU 8000000UL

#include <xc.h>
#include <avr/io.h>
#include <avr/interrupt.h>
#include <avr/pgmspace.h>

uint8_t codigo_barrido = 0b11011111;
uint8_t i = 0, selector;

uint8_t f_read = 1, count = 0, count_int = 0;

uint8_t valores[3] = {0,0,0};

const uint8_t temperatura[] PROGMEM = {4};
uint8_t temp;

ISR(INT0_vect); // Switch
interrupt (INT0)
ISR(INT1_vect); //
Optical sensor interrupt (INT1)
ISR(TIMER0_COMP_vect); // RFID read
(TIMER0)
ISR(TIMER2_COMP_vect); // 7 segment display (TIMER2)
```

```

int main(void){

    /*----- Port set up -----*/

    DDRD |= (0 << PD2);           // Switch pin
    DDRD |= (0 << PD3);           // Optical
    sensor pin
    DDRA = 0b00000000;           // RFID pin


    DDRD |= (1 << PD4);           // Heater port
    (PWM = 0C1B)
    DDRB |= (1 << PB0);           // Electro valve
    port
    DDRC |= 0b11111111;          // 7 segments
    display port


    /*----- Control word -----*/

    // External interrupts

    GICR = (1 << INT0) | (1 << INT1);
    MCUCR = (1 << ISC00) | (1 << ISC11);


    // Timers interrupts

    TIMSK = (1 << OCIE0) | (1 << OCIE2);


    sei();


    while(1);

    return 0;
}


ISR(INT0_vect){

    if(f_read == 1){

        OCR0 = 196;

        TCCR0 = (1 << WGM01) | (1 << CS02) | (1 << CS00);
        //Initialize 25ms Timer
    }
}

```

```

OCR1A = 781;

OCR1B = 0;

TCCR1A |= (1 << COM1B1) | (1 << WGM11) | (1 << WGM10);
//Initialize PWM
TCCR1B |= (1 << WGM13) | (1 << WGM12) | (1 << CS12) | (1 <<
CS10);
//Initialize PWM

OCR2 = 39;

TCCR2 = (1 << WGM21) | (1 << CS22) | (1 << CS21) | (1 << CS20);

f_read = 0;
} else{

TCCR0 = 0; // Turn off 100ms Timer

TCCR1A = 0; // Stop PWM
TCCR1B = 0; // Stop PWM

TCCR2 = 0;

f_read = 1;

}

}

ISR(TIMER0_COMP_vect){
    if(count_int == 3){
        count_int = 0;
        valores[count] = PINA;
        if(count == 0){
            count++;
        } else if(count == 1){
            temp = pgm_read_byte(&temperatura[0]);
            if(valores[count] < temp){
                OCR1B = 586;
                // 75% PWM
            } else if (valores[count] >= temp){

```

```

OCR1B = 195;

// 25% PWM
    }

    count++;

} else if(count == 2){

    if(valores[count] < 3){

        PORTB |= (1 << PB0);

    } else{

        PORTB &= ~(1 << PB0);

    }

    count = 0;

}

} else{

    count_int++;

}

}

ISR(INT1_vect){

    TCCR0 = 0;
    // Turn down 100ms Timer
    TCCR1A = 0;
    // Stop PWM
    TCCR1B = 0;

    TCCR2 = 0;

}

ISR(TIMER2_COMP_vect){

    selector = codigo_barrido & 0xF0; // 0-Mask to 4 LSB
    PORTC = selector + valores[i++]; // Selector + value to 7 segments
    codigo_barrido = (codigo_barrido << 1); // Shift left (next digit)
    if(i > 2){

        i = 0;

        codigo_barrido = 0b11011111;

    }

}

```

4) Esquemático de Hardware (Simulación Proteus):

