**CPE301 – SPRING 2018**

Design Assignment 3

DO NOT REMOVE THIS PAGE DURING SUBMISSION:

The student understands that all required components should be submitted in complete for grading of this assignment.

NO	SUBMISSION ITEM	COMPLETED (Y/N)	MARKS (/MAX)
1	COMPONENTS LIST AND CONNECTION BLOCK DIAGRAM w/ PINS		
2.	INITIAL CODE OF TASK 1/A		
3.	INCREMENTAL / DIFFERENTIAL CODE OF TASK 2/B		
3.	INCREMENTAL / DIFFERENTIAL CODE OF TASK 3/C		
3.	INCREMENTAL / DIFFERENTIAL CODE OF TASK 4/D		
3.	INCREMENTAL / DIFFERENTIAL CODE OF TASK 5/E		
4.	SCHEMATICS		
5.	SCREENSHOTS OF EACH TASK OUTPUT		
5.	SCREENSHOT OF EACH DEMO		
6.	VIDEO LINKS OF EACH DEMO		
7.	GOOGLECODE LINK OF THE DA		

1.   COMPONENTS LIST AND CONNECTION BLOCK DIAGRAM w/ PINS

Atmega328 Xplained Mini, Computer, LM34 chip.
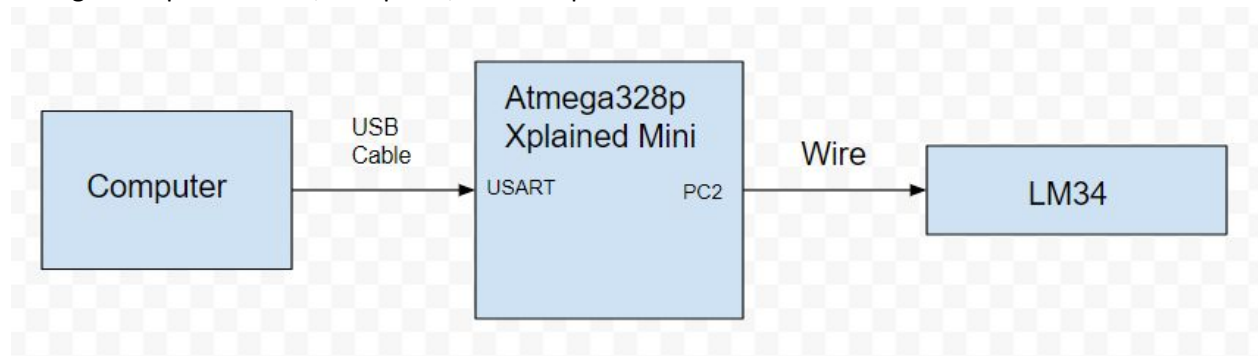
2.   INITIAL/DEVELOPED CODE OF TASK 1/A

```c
/*
 * Assignment3.c
 *
 * Created: 3/29/2018 4:07:41 PM
 * Author : JSharpHalpin
 */

/* ADC Test
For an Atmega 48 88 or 168
Sends ADC results to the serial port
Set your terminal to 2400 N 8 1
Atmega168 DIP TX PD1 (pin3)
Atmega168 DIP RX PD0 (pin2)
Atmega168 DIP ADC2 PC2 (PIN25) */
#define F_CPU 16000000UL        //set clock rate at 16 MHz
#define BAUD 9600               //set baud rate to 9600
#define MYUBRR F_CPU/16/BAUD-1  //set the UBRR number

//#define UBRR_1200 51
//#define UBRR_2400 25 // for 1Mhz
// #define UBRR_2400 207 // for 8Mhz with .2% error
// #define UBRR_9600 51 // for 8Mhz with .2% error
// #define UBRR_19200 25 // for 8Mhz with .2% error
#include <avr/io.h>
#include <util/delay.h>
#include <stdio.h>
#include <avr/interrupt.h>

void read_adc(void); // Function Declarations
void adc_init(void);
void USART_init( unsigned int ubrr );
void USART_tx_string(char *data);
volatile unsigned int adc_temp;
char outs[20];

int main(void) {

    adc_init(); // Initialize the ADC (Analog / Digital Converter)
    USART_init(MYUBRR); // Initialize the USART (RS232 interface)
    USART_tx_string("Connected!\r\n"); // we're alive!
    _delay_ms(125); // wait a bit

    sei();
    while(1)
    {
    }
}
```

```c
void adc_init(void)
{
    /** Setup and enable ADC **/
    ADMUX = (0<<REFS1)| // Reference Selection Bits

    (1<<REFS0)| // AVcc - external cap at AREF
    (0<<ADLAR)| // ADC Left Adjust Result
    (0<<MUX2)| // ANalog Channel Selection Bits
    (1<<MUX1)| // ADC2 (PC2 PIN25)
    (0<<MUX0);

    ADCSRA = (1<<ADEN)| // ADC ENable

    (0<<ADSC)| // ADC Start Conversion
    (0<<ADATE)| // ADC Auto Trigger Enable
    (0<<ADIF)| // ADC Interrupt Flag
    (0<<ADIE)| // ADC Interrupt Enable
    (1<<ADPS2)| // ADC Prescaler Select Bits
    (0<<ADPS1)|
    (1<<ADPS0);

    // Timer/Counter1 Interrupt Mask Register

    TIMSK1 |= (1<<TOIE1); // enable overflow interrupt
    TCCR1B |= (1<<CS12)|(1<<CS10); // native clock
    TCNT1 = 49911;      //set Timer counter

}

/* READ ADC PINS */
void read_adc(void) {
    unsigned char i =4;
    adc_temp = 0;
    while (i--) {
        ADCSRA |= (1<<ADSC);
        while(ADCSRA & (1<<ADSC));
        adc_temp+= ADC;
        _delay_ms(50);
    }
    adc_temp = adc_temp / 8; // Average a few samples

}


/* INIT USART (RS-232) */
void USART_init( unsigned int ubrr ) {
    UBRR0H = (unsigned char)(ubrr>>8);
    UBRR0L = (unsigned char)ubrr;
    UCSR0B = (1 << TXEN0); // Enable receiver, transmitter & RX interrupt
    UCSR0C = (3 << UCSZ00); //asynchronous 8 N 1
}

void USART_tx_string( char *data ) {
    while ((*data != '\0')) {
        while (!(UCSR0A & (1 <<UDRE0)));
        UDR0 = *data;
        data++;
    }
}

ISR(TIMER1_OVF_vect)
{
    read_adc();     //call the ADC read function
    snprintf(outs,sizeof(outs),"%3d\r\n", adc_temp);// print it
    USART_tx_string(outs);  //Ouputs a string to the screen
    TCNT1 = 49911;          //reset Timer counter
}
```
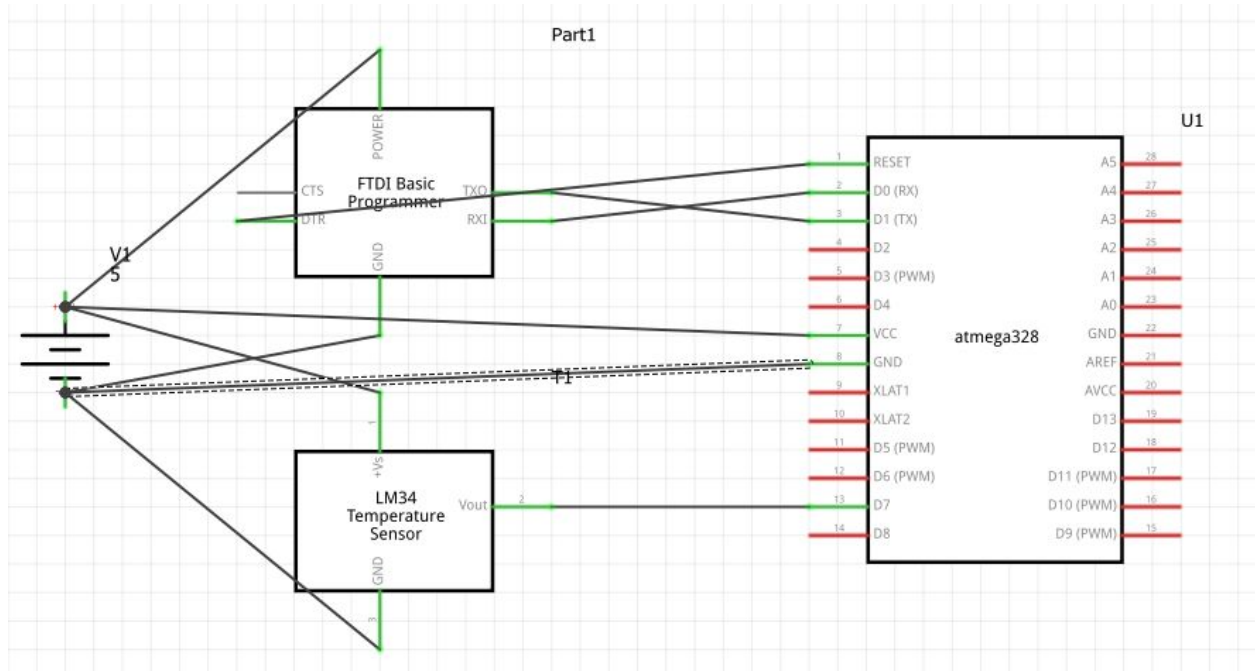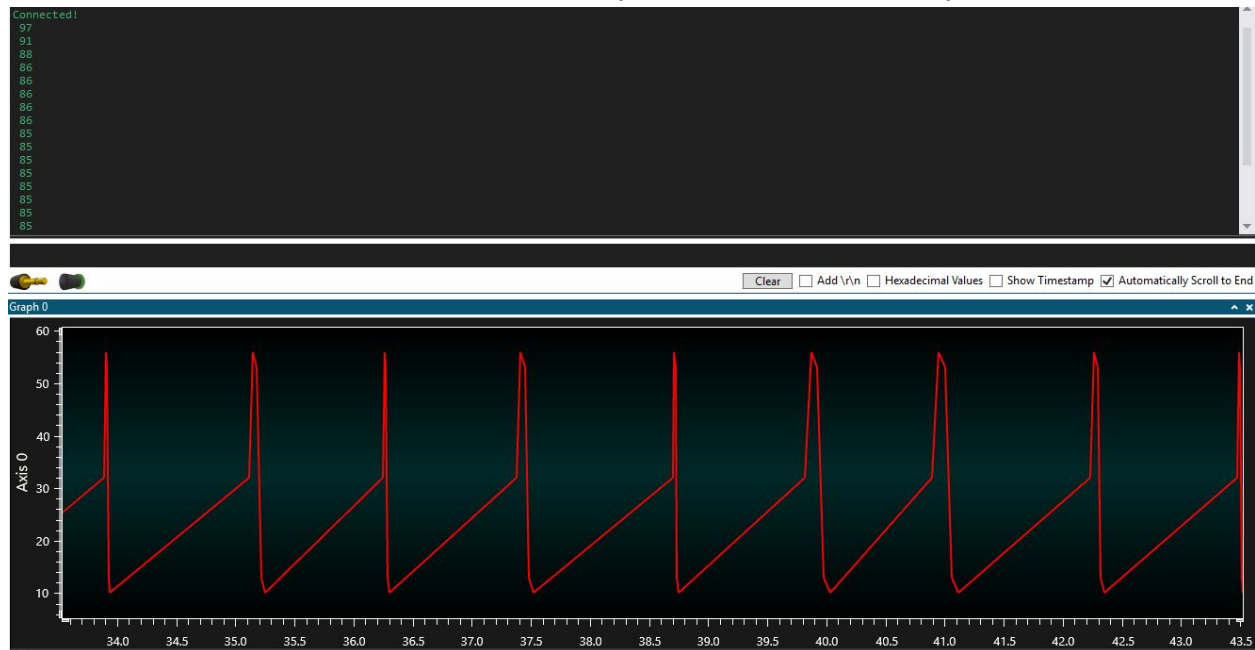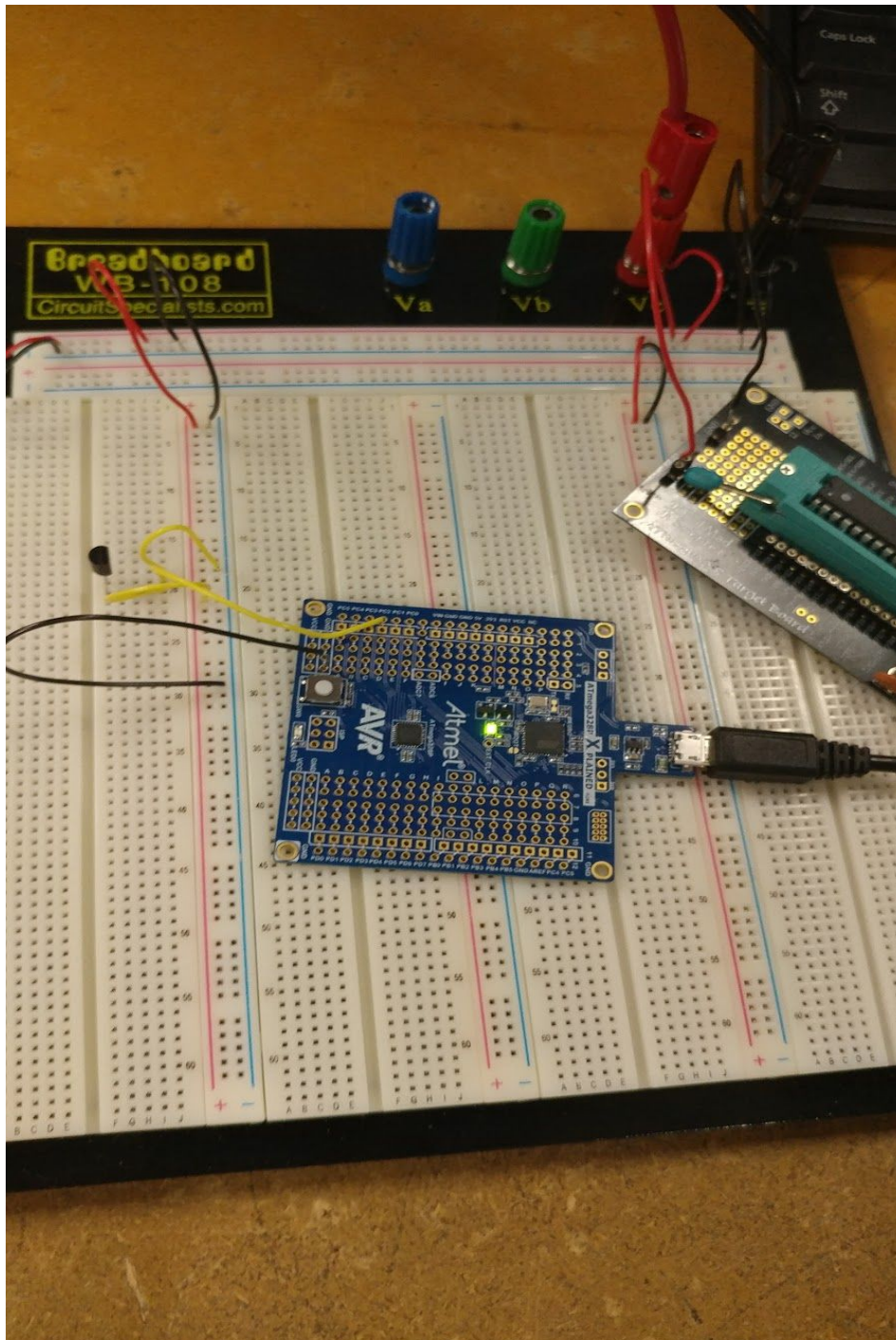
3. SCHEMATICS

4. SCREENSHOTS OF EACH TASK OUTPUT (ATMEL STUDIO OUTPUT)

5. SCREENSHOT OF EACH DEMO (BOARD SETUP)

6. VIDEO LINKS OF EACH DEMO
https://youtu.be/D2bYWDZFLFE

7. GITHUB LINK OF THIS DA

Student Academic Misconduct Policy
http://studentconduct.unlv.edu/misconduct/policy.html

"This assignment submission is my own, original work".

Joseph Sharp Halpin