Your NAME

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

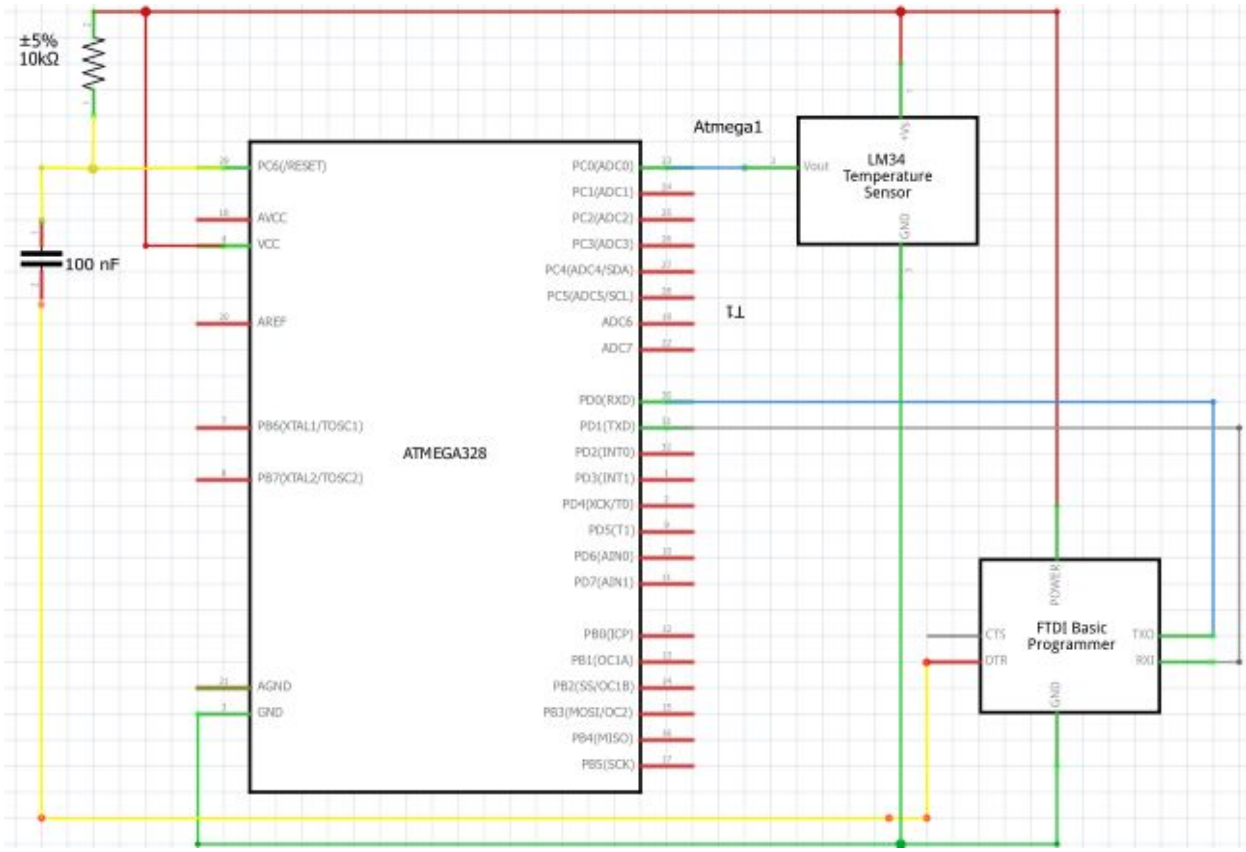
Atmega328P
LM34
TFDI Breakout board
10kOhm resistor
100nF capacitor

2. INITIAL/DEVELOPED CODE OF TASK 1/A

```
#define F_CPU 1600000UL
#define BAUD 9600
#define MYUBRR F_CPU/16/BAUD-1

#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];

ISR(TIMER1_OVF_vect){
   read_adc();
   snprintf(outs,sizeof(outs),"%3d\r\n", adc_temp);  //    print   it
   USART_tx_string(outs);
   TCNT1 = 0xC2F7;     //reset counter for a 1 second delay
}

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!
   sei();    //enable interrupts
   while(1){}
}

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
   (0<<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);

   TIMSK1 = (1<<TOIE1);    // set timer overflow interrupt
   TCCR1B  |=  (1<<CS12)|(1<<CS10);    //  native  clock
```

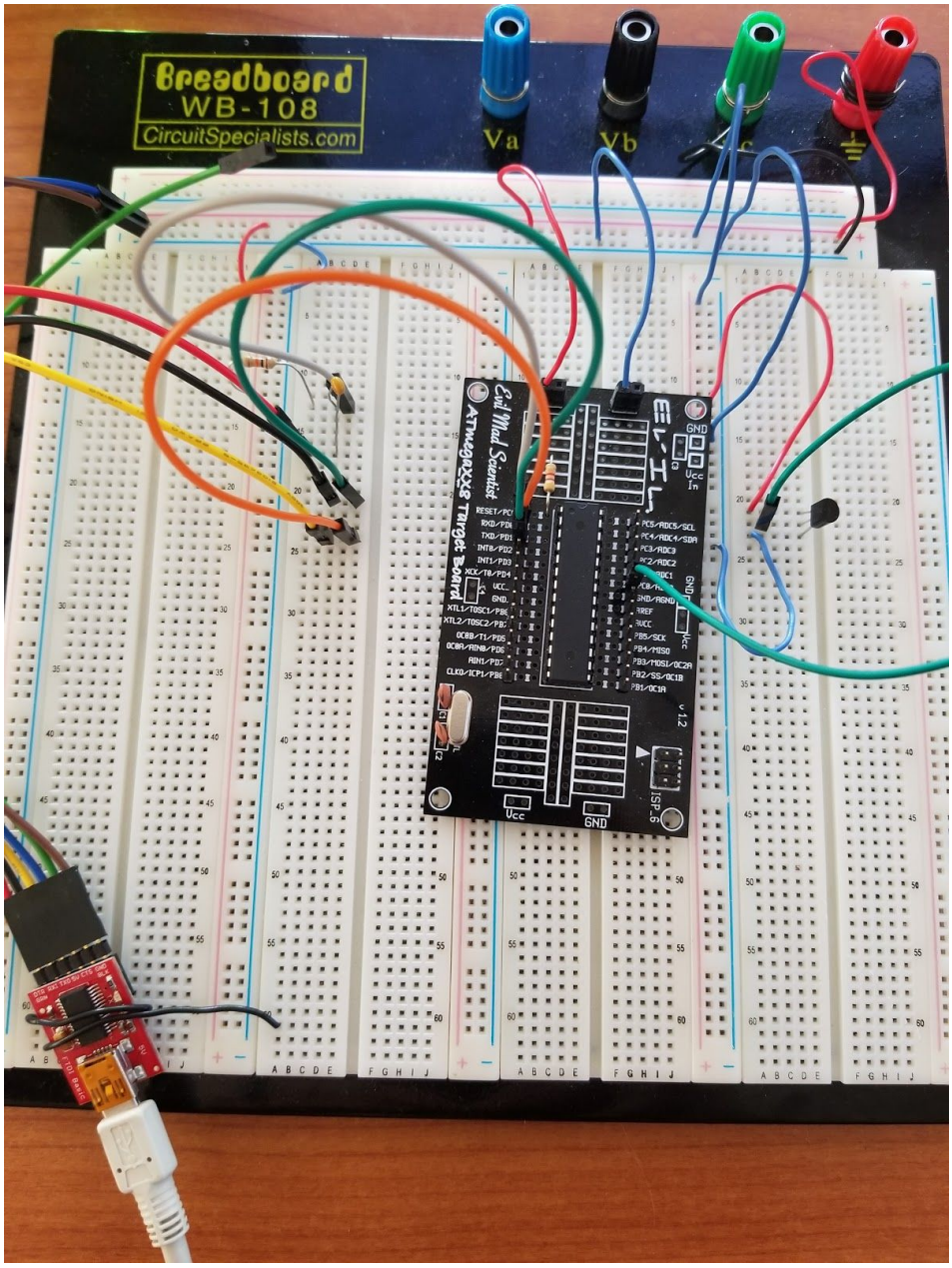
```
   TCNT1 = 0xC2F7;        // for 1 second delay with 16MHz clock, tcnt1 = 15624, thus 65535 - 15624 = 49911 (0xC2F7)
}

/* 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 / 4; // 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
}
/* SEND A STRING TO THE RS-232 */
void USART_tx_string( char *data ) {
   while ((*data != '\0')) {
      while (!(UCSR0A & (1 <<UDRE0)));
      UDR0 = *data;
      data++;
   }
}
```

3. SCHEMATICS



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

5. SCREENSHOT OF EACH DEMO (BOARD SETUP)



6. VIDEO LINKS OF EACH DEMO

7. GITHUB LINK OF THIS DA

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"*This assignment submission is my own, original work*".
Phillip Sortomme