CpE301 - Design Assignment 5 - Midterm 2 (15 Points)

Design Assignment 5:
DUE: 4/20/2016
The goal of the assignment is to develop the above code to do the following:

1. Write an AVR C program to control the speed of the DC Motor using a potentiometer connected to any of the analog-in port.
2. Write an AVR C program to control the speed of the Stepper Motor using a potentiometer connected to any of the analog-in port.
3. Write an AVR C program to control the position of the Servo Motor using a potentiometer connected to any of the analog-in port. When pot value is 0 the servo is at position 0 deg. and when pot value is max (approx. 5V) the servo is at position 180 deg.

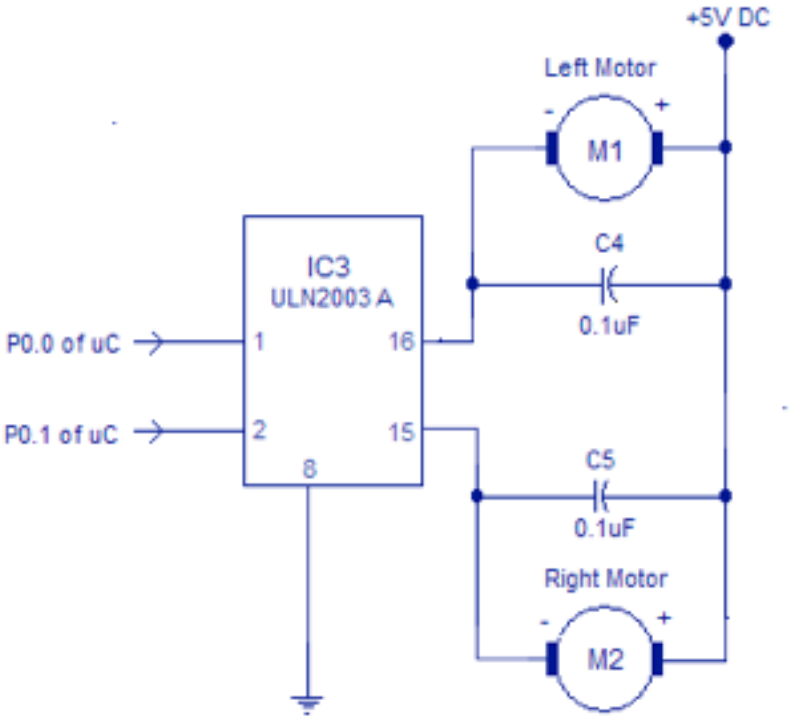
Submission:

The following are required for successful completion of the design assignment:

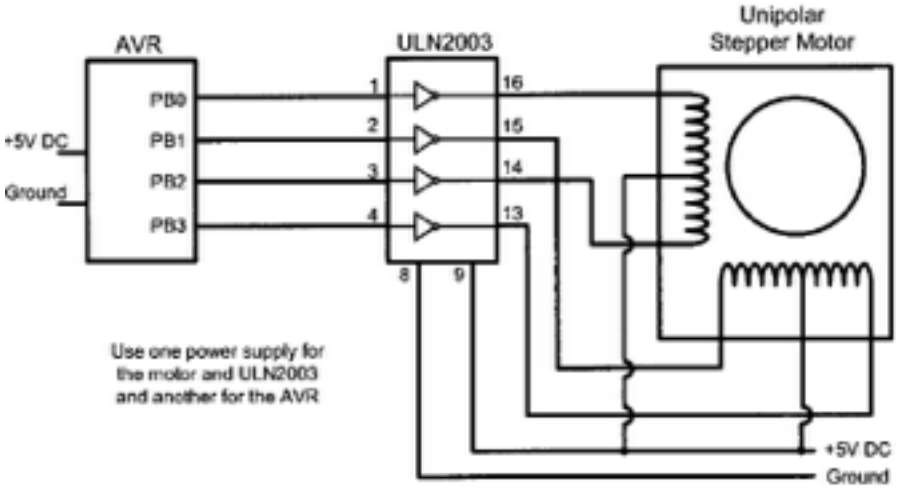
a. AVR C code that has been compiled and working.
b. The C code should be well documented with explanation of every instruction.
c. A word document that contains the flow chart of the assembly code along with the snapshots of the schematics, components connected on the breadboard and screenshots.

NOTES:

DC MOTOR CONTROL:



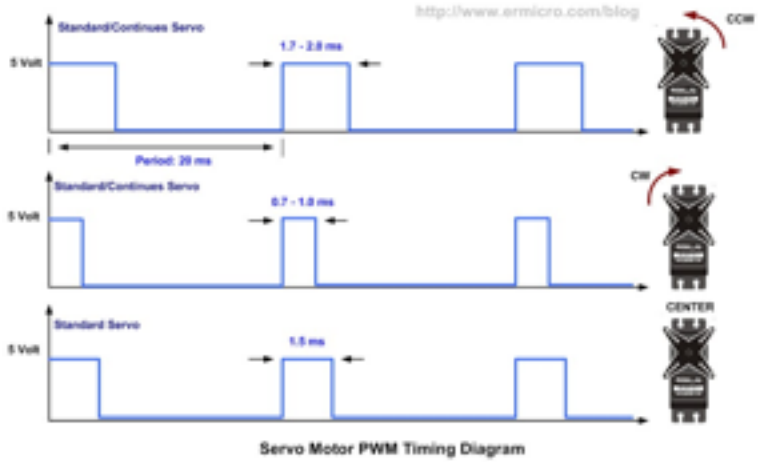
STEPPER MOTOR CONTROL:
Write a program to monitor the status of SW and perform the following:
(a) If SW = 0, the stepper motor moves clockwise.
(b) If SW = 1, the stepper motor moves counter clockwise.



```
#define F_CPU    8000000UL      //XTAL = 8 MHz
#include "avr/io.h"
#include "util/delay.h"

int main ()
{
      DDRA = 0x00;
      DDRB = 0xFF;
      while (1)
      {
            if( (PINA&0x80) == 0)
            {
                  PORTB = 0x66;
                  _delay_ms (100);
                  PORTB = 0xCC;
                  _delay_ms (100);
                  PORTB = 0x99;
                  _delay_ms (100);
                  PORTB = 0x33;
                  _delay_ms (100);
            }
            else
            {
                  PORTB = 0x66;
                  _delay_ms (100);
                  PORTB = 0x33;
                  _delay_ms (100);
                  PORTB = 0x99;
                  _delay_ms (100);
                  PORTB = 0xCC;
                  _delay_ms (100);
            }
      }
}
```

SERVO MOTOR:



Servo Motor PWM Timing Diagram

```
#include <avr\io.h>
int main(void)
{
        //Port D pins as input
        DDRD=0x00;
        //Enable internal pull ups
        PORTD=0xFF;
        //Set PORTB1 pin as output
        DDRB=0xFF;
```

```
        //TOP=ICR1;
        //Output compare OC1A 8 bit non inverted PWM
        //Clear OC1A on Compare Match, set OC1A at TOP
        //Fast PWM
        //ICR1=20000 defines 50Hz PWM
        ICR1=20000;
        TCCR1A|=(0<<COM1A0)|(1<<COM1A1)|(0<<COM1B0)|(0<<COM1B1)|
        (0<<FOC1A)|(0<<FOC1B)|(1<<WGM11)|(0<<WGM10);
        TCCR1B|=(0<<ICNC1)|(0<<ICES1)|(1<<WGM13)|(1<<WGM12)|
        (0<<CS12)|(1<<CS11)|(0<<CS10);
        //start timer with prescaler 8
        for (;;)
        {
                if(bit_is_clear(PIND, 0))
                {
                //increase duty cycle
                OCR1A+=10;
                loop_until_bit_is_set(PIND, 0);
                }
                if(bit_is_clear(PIND, 1))
                {
                //decease duty cycle
                OCR1A-=10;
                loop_until_bit_is_set(PIND, 1);
                }
        }
}
```

PS: Use the A2D program below as a reference to read the pot values.

```
#include <avr/io.h>          //standard AVR header
int main (void)
{
   DDRB = 0xFF;              //make Port B an output
   DDRD = 0xFF;              //make Port D an output
   DDRA = 0;                 //make Port A an input for ADC input
   ADCSRA= 0x87;             //make ADC enable and select ck/128
   ADMUX= 0xC0;              //2.56V Vref, ADC0 single ended input
                             //data will be right-justified
   while (1){
     ADCSRA|=(1<<ADSC);      //start conversion
     while((ADCSRA&(1<<ADIF))==0);//wait for conversion to finish
     PORTD = ADCL;           //give the low byte to PORTD
     PORTB = ADCH;           //give the high byte to PORTB
   }
   return 0;
}
```