

Design Assignment 5

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)
0.	COMPONENTS LIST		
1.	INITIAL CODE OF TASK 1		
2.	INITIAL CODE OF TASK 2		
3.	INITIAL CODE OF TASK 3		
4.	SCHEMATICS & PCB layouts		
5	VIDEO LINKS OF EACH DEMO		
6	GITHUB LINK OF THE DA		

0.	COMPONENTS LIST AND CONNECTION BLOCK DIAGRAM w/ PINS		
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Components:

DC motor
Stepper motor
Servo motor
Atmega328P x 1
ILD74 Optoisolator
330 Ω resistor
10k Ω resistor
100k Ω resistor
0.1 μ F capacitor
1N4004 diode
TIP120 transistor
ULN2003

1.	INITIAL CODE OF TASK 1		
----	------------------------	--	--

```
#include <avr/io.h>
```

```
int read_speed();
```

```
int main()
```

```
{
    DDRC &= 0xFE; //make PORTC0 input pin
    DDRB |= (1<<PORTB1); // set PB1(OC1A) as output pin
    // enable 10 bit Fast PWM, select inverted PWM, 256 prescaler
    TCCR1A |= (1<<COM1A1) | (1<<COM1A0) | (1<<WGM10) | (1<<WGM11);
    TCCR1B |= (1<<WGM12) | (1<<CS12);

    while(1)
    {
        if((TIFR1 & (1<<OCF1A)) != 0)
            OCR1A = read_speed();
    }
    return 0 ;
}
```

```
int read_speed()
```

```
{
    ADCSRA = (1<<ADEN) | (1<<ADPS2) | (1<<ADPS1) | (1<<ADPS0); // ADC Enable, Div factor = 128
    ADMUX = 0x00; //Use ADC0, ARef voltage ref
    ADCSRA |= (1<<ADSC); // Start conversion
    while((ADCSRA & (1<<ADIF))==0);
    return ADC;
}
```

2.	INITIAL CODE OF TASK 2		
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```

#define F_CPU 8000000UL
#include <avr/io.h>
#include <util/delay.h>

int read_speed();

int main()
{
    DDRD = 0xFF;
    DDRC &= 0xFE; //make PORTC0 input pin
    DDRB |= (1<<PORTB1); // set PB1(OC1A) as output pin
    // enable 10 bit Fast PWM, select inverted PWM, 1024 prescaler
    TCCR1A |= (1<<COM1A1) | (1<<COM1A0) | (1<<WGM10) | (1<<WGM11);
    TCCR1B |= (1<<WGM12) | (1<<CS12) | (1<<CS10);

    while(1)
    {
        if((TIFR1 & (1<<OCF1A)) != 0)
            OCR1A = read_speed();

        if ((PINB&0x02) != 0x00)
        {
            PORTD = 0x66;
            _delay_ms(2);
            PORTD = 0xCC;
            _delay_ms(2);
            PORTD = 0x99;
            _delay_ms(2);
            PORTD = 0x33;
            _delay_ms(2);
        }
    }
    return 0;
}

int read_speed()
{
    ADCSRA = (1<<ADEN) | (1<<ADPS2) | (1<<ADPS1) | (1<<ADPS0); // ADC Enable, Div factor = 128
    ADMUX = 0x00; //Use ADC0, ARef voltage ref
    ADCSRA |= (1<<ADSC); // Start conversion
    while((ADCSRA & (1<<ADIF))==0);
    return ADC;
}

```

3.	INITIAL CODE OF TASK 3		
----	------------------------	--	--

```

#include <avr/io.h>
#define F_CPU 8000000UL
#include <util/delay.h>

int get_pos();
int main()
{
    DDRC &= 0xFE; //make PORTC0 input pin
    DDRB |= (1<<PORTB1); // set PB1(OC1A) as output pin
    //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;

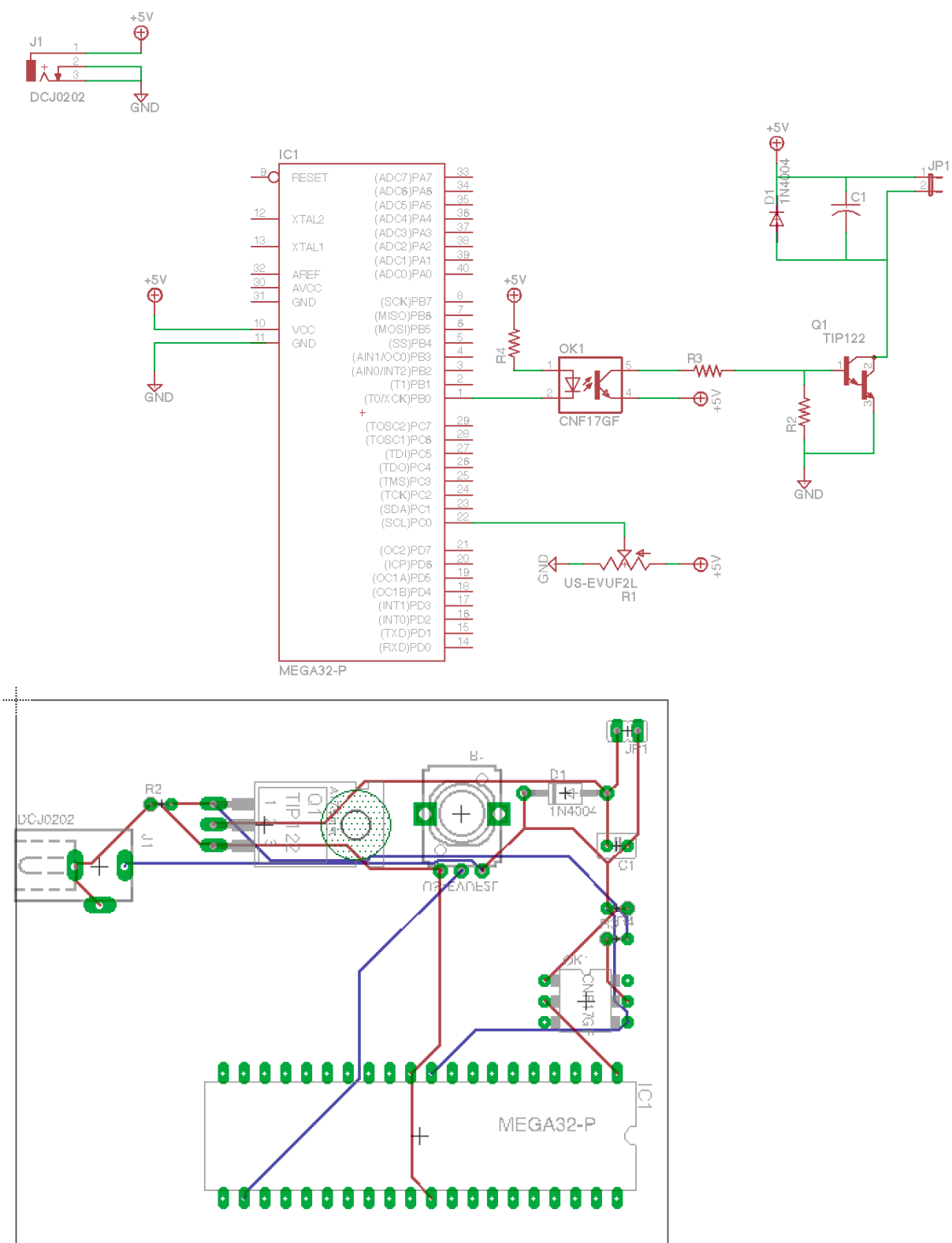
    TCCR1A|=(0<<COM1A0)|(1<<COM1A1)|(0<<COMB0)|(0<<COM1B1)|(0<<FOC1A)|(0<<FOC1B)|
(1<<WGM11)|(0<<WGM10); //TCCR1A = 0x82
    TCCR1B|=(0<<ICNC1)|(0<<ICES1)|(1<<WGM13)|(1<<WGM12)|(0<<CS12)|(1<<CS11)|(0<<CS10);
    //start timer with prescaler 8
    int offset = 490; // 0 position offset
    // Servo range is from 2140 to 490, so 1650 steps
    // 1650/1024 = 1.61, so each ADC value = 1.6 servo steps
    while (1)
    {
        OCR1A = (get_pos()*16)/10 + offset;
    }
}

int get_pos()
{
    ADCSRA = (1<<ADEN) | (1<<ADPS2) | (1<<ADPS1) | (1<<ADPS0); // ADC Enable, Div factor = 128
    ADMUX = 0x00; //Use ADC0, ARef voltage ref
    ADCSRA |= (1<<ADSC); // Start conversion
    while((ADCSRA & (1<<ADIF))==0);
    return ADC;
}

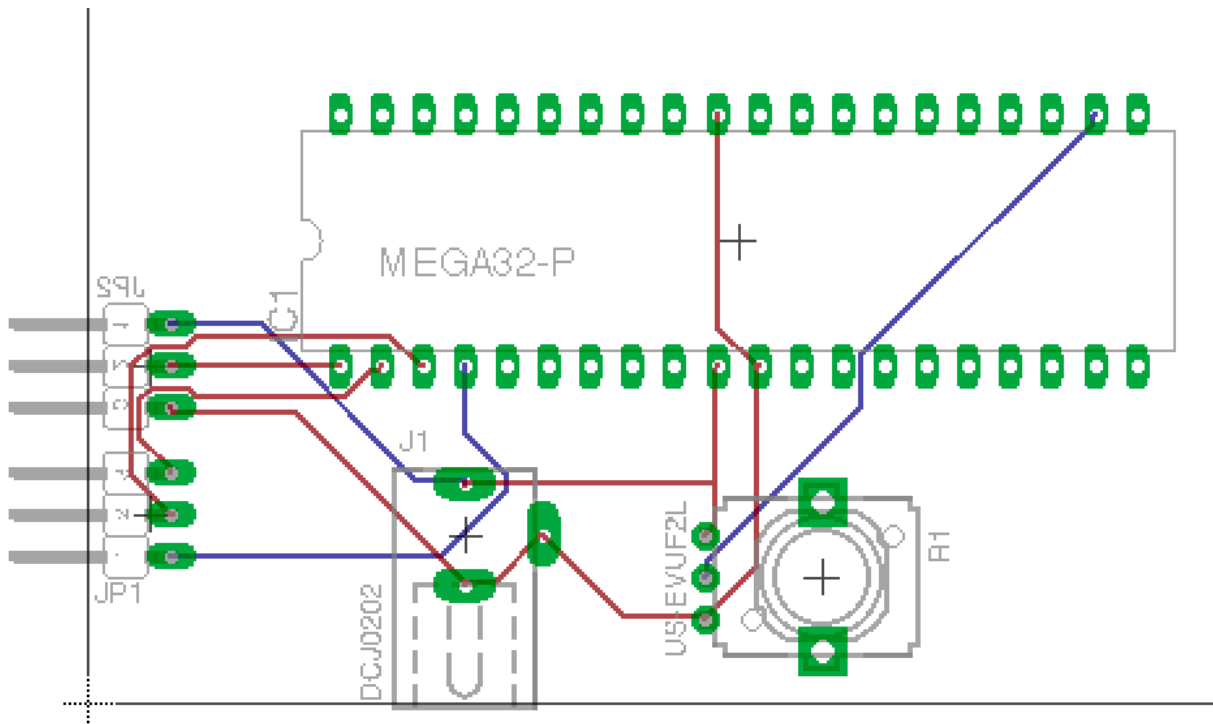
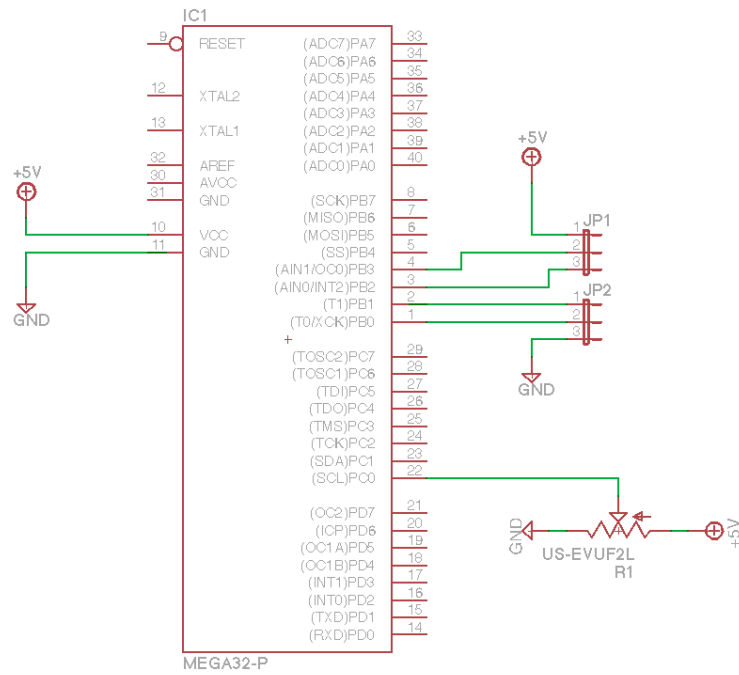
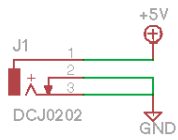
```

4.	SCHEMATICS & PCB layout		
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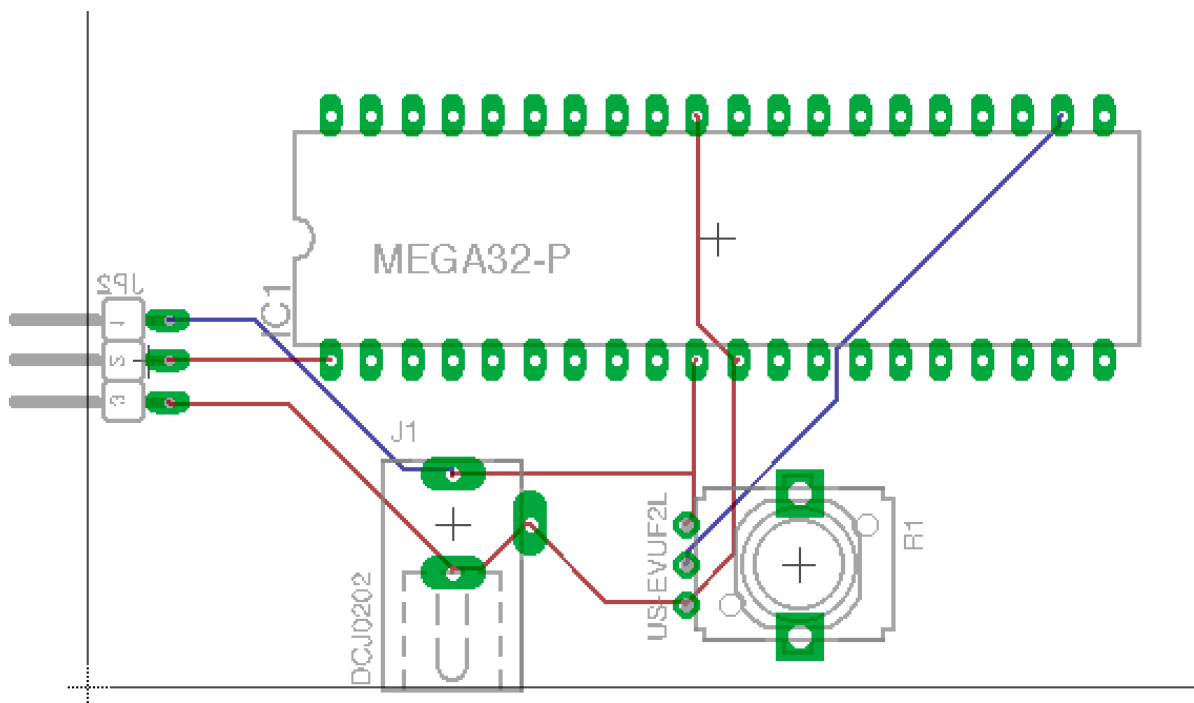
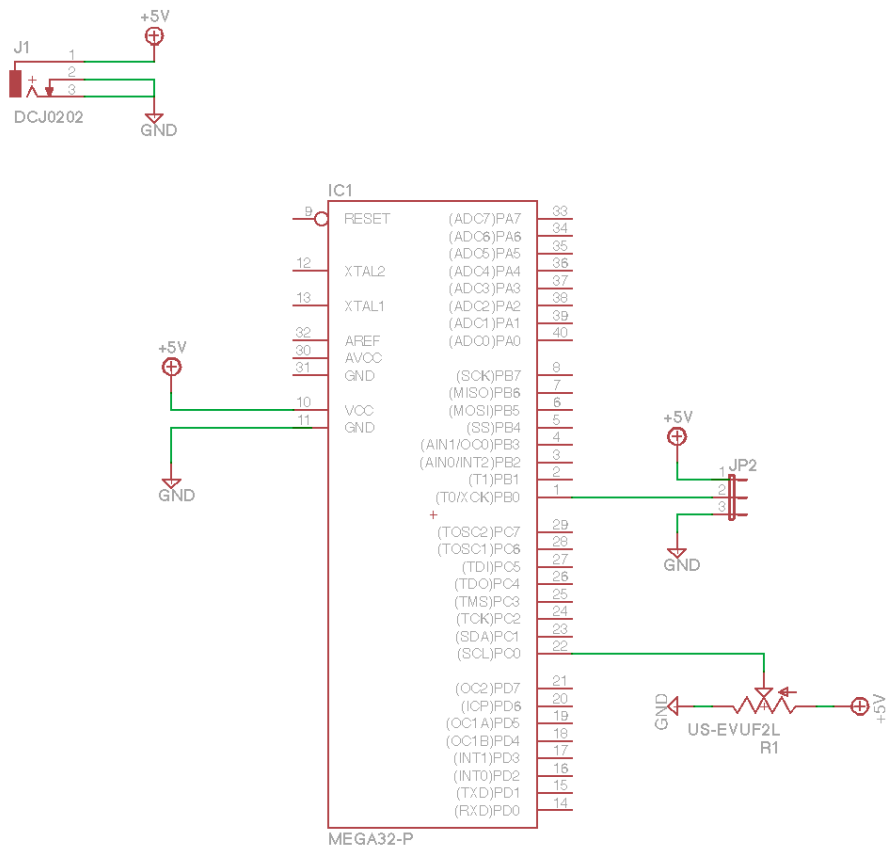
Task 1:



Task 2:



Task 3:



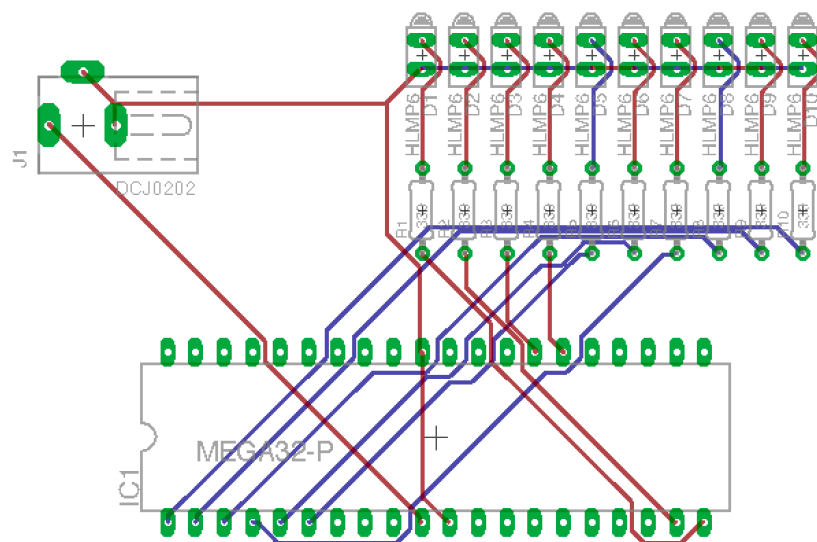
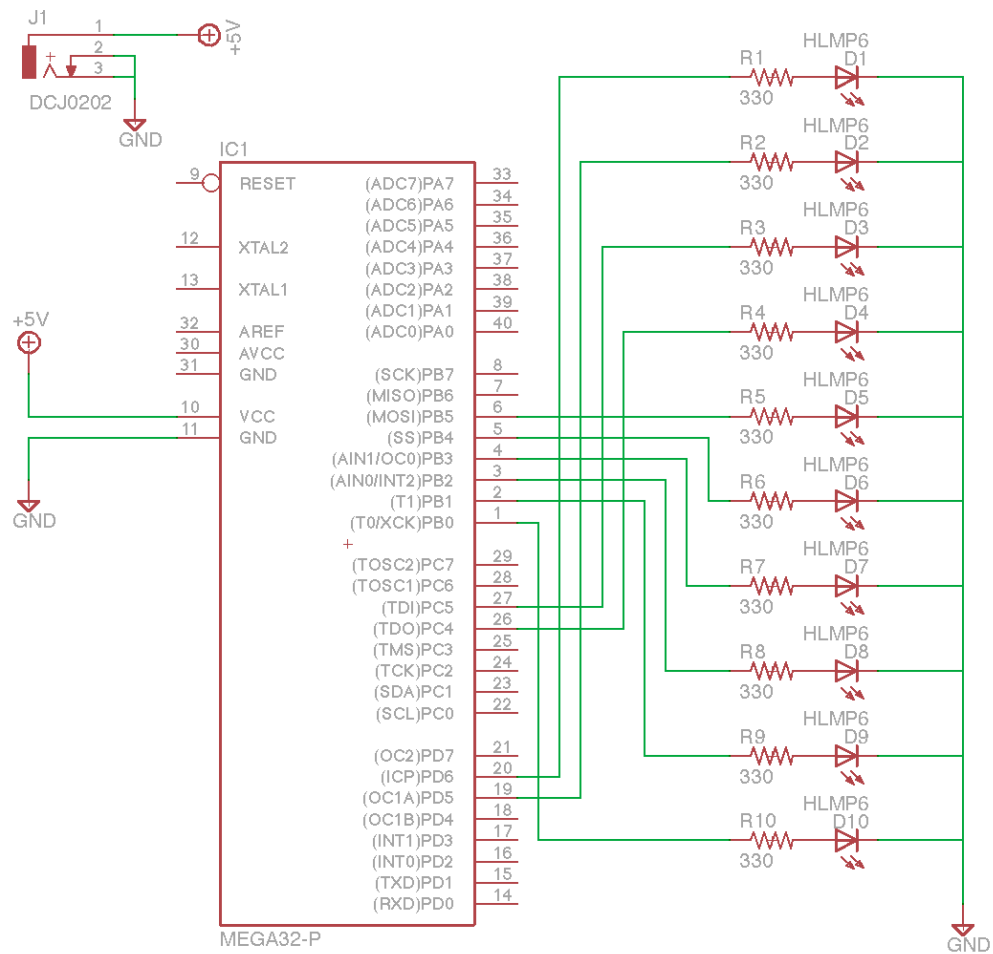
5	VIDEO LINKS OF EACH DEMO		
Task 1: https://youtu.be/2k1L3bCr4Xs Task 2: https://youtu.be/0--jfc3M6g Task 3: https://youtu.be/wePPnr7LCcl			
6	GITHUB LINK OF THE DA		
https://github.com/jmsikorski/UNLVCpE301Sp16/tree/master/DA5			

Student Academic Misconduct Policy

<http://studentconduct.unlv.edu/misconduct/policy.html>

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

JASON M. SIKORSKI



main.asmTask 1

```
1 ;
2 ; DA2.asm
3 ;
4 ; Created: 3/9/2016 10:45:09 PM
5 ; Author : jmsikorski
6 ;
7
8 .INCLUDE "header.inc" ;Include header file
9 .ORG 0x000 ;Beginning of code goes here
10
11 INITSTACK ;Initialize the stack
12
13 SBI DDRC, 0 ;Set PORTC0 to output
14 LDI R17, 0x01 ;Set R17 bit 1 high
15 LDI R16, 0x01 ;Set R16 bit 1 high
16 OUT PORTC, R17 ;Output R17 to PORTC
17 BEGIN:
18 RCALL DELAY ;Call delay subroutine
19 EOR R17, R16 ;Toggle R17 bit 1
20 OUT PORTC, R17 ;Output R17 to PORTC
21 RJMP BEGIN
22
```

100 %

Filter:

AD_CONVERTER

ANALOG_COMPARATOR

CPU

EEPROM

EXTERNAL_INTERRUPT

PORTB

PORTC

PORTD

SPI

TIMER_COUNTER_0

TIMER_COUNTER_1

TIMER_COUNTER_2

TWI

USART0

WATCHDOG

Name Address Value Bits

Processor Status

Name	Value
Program Counter	0x00000009
Stack Pointer	0x08FF
X Register	0x0000
Y Register	0x0000
Z Register	0x0000
Status Register	00000000
Cycle Counter	4000103
Frequency	8.000 MHz
Stop Watch	500.012.88 µs

Registers

R00	0x00
R01	0x00
R02	0x00
R03	0x00
R04	0x00
R05	0x00
R06	0x00
R07	0x00
R08	0x00
R09	0x00
R10	0x00
R11	0x00
R12	0x00
R13	0x00
R14	0x00
R15	0x00
R16	0x01
R17	0x01
R18	0x00
R19	0x00
R20	0x00
R21	0x00
R22	0x00
R23	0x00

main.asmTask 1

```
1 ;
2 ; DA2.asm
3 ;
4 ; Created: 3/9/2016 10:45:09 PM
5 ; Author : jmsikorski
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8 .INCLUDE "header.inc" ;Include header file
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14 LDI R17, 0x01 ;Set R17 bit 1 high
15 LDI R16, 0x01 ;Set R16 bit 1 high
16 OUT PORTC, R17 ;Output R17 to PORTC
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19 EOR R17, R16 ;Toggle R17 bit 1
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22
```

100 %

Filter:

AD_CONVERTER

ANALOG_COMPARATOR

CPU

EEPROM

EXTERNAL_INTERRUPT

PORTB

PORTC

PORTD

SPI

TIMER_COUNTER_0

TIMER_COUNTER_1

TIMER_COUNTER_2

TWI

USART0

WATCHDOG

Name Address Value Bits

Processor Status

Name	Value
Program Counter	0x00000009
Stack Pointer	0x08FF
X Register	0x0000
Y Register	0x0000
Z Register	0x0000
Status Register	00000000
Cycle Counter	8000198
Frequency	8.000 MHz
Stop Watch	1,000.024.75 µs

Registers

R00	0x00
R01	0x00
R02	0x00
R03	0x00
R04	0x00
R05	0x00
R06	0x00
R07	0x00
R08	0x00
R09	0x00
R10	0x00
R11	0x00
R12	0x00
R13	0x00
R14	0x00
R15	0x00
R16	0x01
R17	0x00
R18	0x00
R19	0x00
R20	0x00
R21	0x00
R22	0x00
R23	0x00