Lab 2: Morse Code Decoder

ESE3500: Embedded Systems & Microcontroller Laboratory
University of Pennsylvania

In this document, you'll fill out your responses to the questions listed in the Lab 2 Manual. Please fill out your name and link your Github repository below to begin. Be sure that your code on the repo is up-to-date before submission!

For all the questions that require a video, provide a link to the video (e.g. youtube, google drive, etc.).

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GitHub Repository: https://github.com/ese3500/lab2-amdreier

1.
```c
/*
 * lab2a.c
 *
 * Created: 2/3/2023 12:47:52 PM
 * Author : amdreier
 */

#include <avr/io.h>

void Initialize(void) {
    DDRB |= (1<<DDB4);
    PORTB |= (1<<PORTB4);
    DDRB |= (1<<DDB3);
    PORTB |= (1<<PORTB3);
    DDRB |= (1<<DDB2);
    PORTB |= (1<<PORTB2);
    DDRB |= (1<<DDB1);
    PORTB |= (1<<PORTB1);
}


int main(void)
{
    Initialize();
    while (1)
    {
    }
}
```

```
int main(void)
{
    Initialize();
    while (1)
    {
        if ((PIND & (1 << PIND7))) {
            // set output pins 12 HIGH
            PORTB |= (1 << PORTB4);
        } else {
            // set output pins 12 LOW
            PORTB &= ~(1 << PORTB4);
        }
    }
}
```
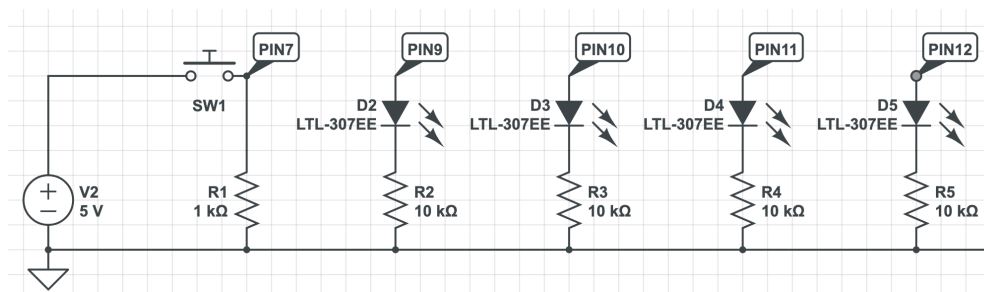
2.

```
int main(void)
{
    Initialize();
    int buttonPressed = 0;
    int count4 = 0;
    while (1)
    {
        if ((PIND & (1 << PIND7)) && !buttonPressed) {
            buttonPressed = 1;
            count4 = (count4 + 1) % 4;
            // set output pins 12-9 based on order
            PORTB = (1 << (count4 + 1));
        } else if (!(PIND & (1 << PIND7)) && buttonPressed) {
            buttonPressed = 0;
        }
    }
}
```

3.

4.

5. An advantage of interrupts is that it allows the processor to run other code while still handling the event. A downside is that it takes time for the processor to start handling the event, so if tight timing is required, an interrupt might not be fast enough.

6. 16Mticks/s * Xms * 1s/1000ms =
    a. 30ms = 480,000 ticks
    b. 200ms = 3,200,000 ticks
    c. 400ms = 6,400,000 ticks

7. The prescaler allows us to control how many ticks from the clock translate to ticks for the timer. This allows us to not only use the 2^16 available timing from the counter, but also increase the range for timings, so we can accurately count to much larger time intervals, without giving up the ability to accurately time very small times.

8.
   https://drive.google.com/file/d/1YeJUyNka9sZDcMBuwe2KP2FvfQm57vwj/view?usp=sharing
   a. Letters pressed within once space time appear in the same word. Larger breaks only add one space between words.
9.
10.