README.md

Lab 1: Ivo Točený

Link to your `Digital-electronics-2` GitHub repository:

GitHub link - 01-tools

Blink example

1. What is the meaning of the following binary operators in C?
   - `|` - Bit Or
   - `&` - Bit And
   - `^` - Bit Xor
   - `~` - Bit Nor
   - `<<` - Bit Left Shift
   - `>>` - Bit Right Shift
2. Complete truth table with operators: `|`, `&`, `^`, `~`

b	a	b or a	b and a	b xor a	not b

b	a	b or a	b and a	b xor a	not b
0	0	0	0	0	1
0	1	1	0	1	1
1	0	1	0	1	0
1	1	1	1	0	0

Morse code

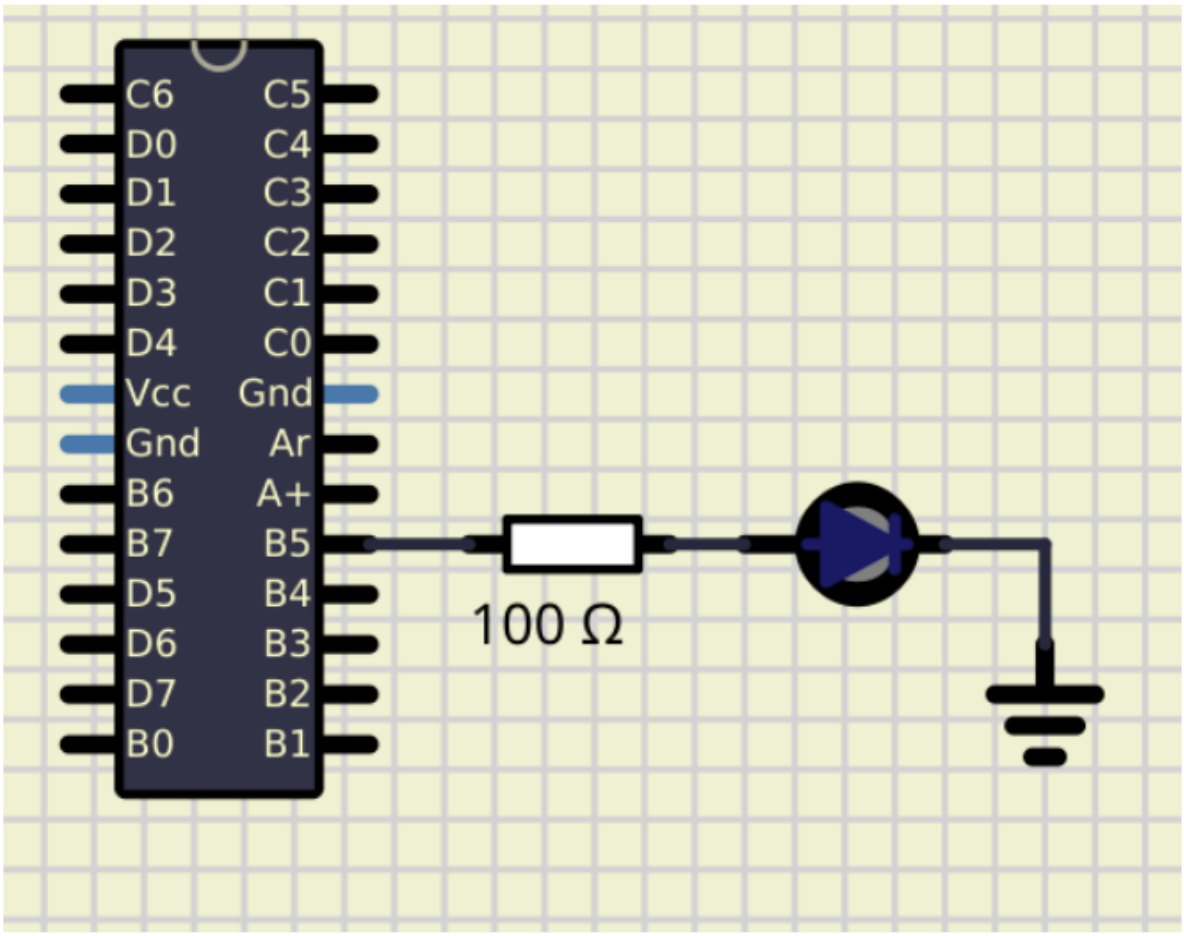
1. Listing of C code with syntax highlighting which repeats one "dot" and one "comma" on a LED:

```
#define LED_GREEN   PB5 // AVR pin where green LED is connected
#define DOT_DELAY 100 // Delay in milliseconds
#define COMMA_DELAY 300 // Delay in milliseconds
#define PAUSE_DELAY 150
#ifndef F_CPU           // Preprocessor directive allows for conditional
                        // compilation. The #ifndef means "if not defined".
# define F_CPU 16000000 // CPU frequency in Hz required for delay
#endif                  // The #ifndef directive must be closed by #endif

int main(void)
{
    // Set pin as output in Data Direction Register
    // DDRB = DDRB or 0010 0000
    DDRB = DDRB | (1<<LED_GREEN);

    // Set pin LOW in Data Register (LED off)
    // PORTB = PORTB and 1101 1111
    PORTB = PORTB & ~(1<<LED_GREEN);

    // Infinite loop
    while (1)
    {
        Make_D_Morse();

        Make_E_Morse();

        Make_2_Morse();
    }


    // Will never reach this
    return 0;
}
```

```
void Make_D_Morse()
{
    PORTB = PORTB ^ (1<<LED_GREEN); //LED ON

    _delay_ms(COMMA_DELAY);

    PORTB = PORTB ^ (1<<LED_GREEN); // LED OFF

    _delay_ms(PAUSE_DELAY);

    PORTB = PORTB ^ (1<<LED_GREEN); // LED ON

    _delay_ms(DOT_DELAY);

    PORTB = PORTB ^ (1<<LED_GREEN);

    _delay_ms(PAUSE_DELAY);

    PORTB = PORTB ^ (1<<LED_GREEN); // LED ON

    _delay_ms(DOT_DELAY);

    PORTB = PORTB ^ (1<<LED_GREEN);

    _delay_ms(PAUSE_DELAY);
}

void Make_E_Morse()
{
    PORTB = PORTB ^ (1<<LED_GREEN); // LED ON

    _delay_ms(DOT_DELAY);

    PORTB = PORTB ^ (1<<LED_GREEN);

    _delay_ms(PAUSE_DELAY);
}

void Make_2_Morse()
{
    PORTB = PORTB ^ (1<<LED_GREEN); // LED ON

    _delay_ms(DOT_DELAY);

    PORTB = PORTB ^ (1<<LED_GREEN);

    _delay_ms(PAUSE_DELAY);

    PORTB = PORTB ^ (1<<LED_GREEN); // LED ON

    _delay_ms(DOT_DELAY);
```

```
    PORTB = PORTB ^ (1<<LED_GREEN);

    _delay_ms(PAUSE_DELAY);

    PORTB = PORTB ^ (1<<LED_GREEN); //LED ON

    _delay_ms(COMMA_DELAY);

    PORTB = PORTB ^ (1<<LED_GREEN);

    _delay_ms(PAUSE_DELAY);

    PORTB = PORTB ^ (1<<LED_GREEN); //LED ON

    _delay_ms(COMMA_DELAY);

    PORTB = PORTB ^ (1<<LED_GREEN);

    _delay_ms(PAUSE_DELAY);

    PORTB = PORTB ^ (1<<LED_GREEN); //LED ON

    _delay_ms(COMMA_DELAY);

    PORTB = PORTB ^ (1<<LED_GREEN);

    _delay_ms(PAUSE_DELAY);
}
```

2. Scheme of Morse code application, i.e. connection of AVR device, LED, resistor, and supply voltage. The image can be drawn on a computer or by hand. Always name all components and their values!


C6
D0
D1
D2
D3
D4
Vcc
Gnd
B6
B7
D5
D6
D7
B0
C5
C4
C3
C2
C1
C0
Gnd
Ar
A+
B5
B4
B3
B2
B1
100 Ω