


Judah Ben-Eliezer

112352727

2/18/2020

Prelab 2:

Bitwise Logical Operations in C

```
1  /*
2  * parallel_in_parallel_out_flat.c
3  *
4  * Created: 2/18/2021 6:12:01 PM
5  * Author : hp
6  */
7
8  #include <avr/io.h>
9
10 #define PORTA_INPUT_CONFIGURATION_gc 0x03
11 #define PORTC_INPUT_CONFIGURATON_gc 0xFC
12 #define PORTD_OUTPUT_CONFIGURATION_gc 0xFF
13
14 int main(void)
15 {
16
17     PORTA_DIR  &= PORTA_INPUT_CONFIGURATION_gc;
18     PORTC_DIR  &= PORTC_INPUT_CONFIGURATON_gc;
19     PORTD_DIR  |= PORTD_OUTPUT_CONFIGURATION_gc;
20
21     uint8_t* ctrl_ptr = (uint8_t*)&PORTA_PIN2CTRL;
22
23     for (uint8_t i = 0; i < 6; ++i) {
24         *(ctrl_ptr + i) |= PORT_PULLUPEN_bm;
25     }
26
27     PORTC_PIN0CTRL |= PORT_PULLUPEN_bm;
28     PORTC_PIN1CTRL |= PORT_PULLUPEN_bm;
29
30     while (1)
31     {
32         PORTD_OUT = (PORTA_IN | PORTA_INPUT_CONFIGURATION_gc) | (PORTC_IN | 
33             PORTC_INPUT_CONFIGURATON_gc);
34     }
35
36
```

```
1  /*
2  * parallel_in_parallel_out_struct.c
3  *
4  * Created: 2/18/2021 6:33:10 PM
5  * Author : Judah Ben-Eliezerj
6  */
7
8  #include <avr/io.h>
9
10 #define PORTA_INPUT_CONFIGURATION_gc 0x03
11 #define PORTC_INPUT_CONFIGURATON_gc 0xFC
12 #define PORTD_OUTPUT_CONFIGURATION_gc 0xFF
13
14 int main(void)
15 {
16
17     PORTA.DIR &= PORTA_INPUT_CONFIGURATION_gc;
18     PORTC.DIR &= PORTC_INPUT_CONFIGURATON_gc;
19     PORTD.DIR |= PORTD_OUTPUT_CONFIGURATION_gc;
20
21     uint8_t* ctrl_ptr = (uint8_t*)&PORTA.PIN2CTRL;
22
23     for (uint8_t i = 0; i < 6; ++i) {
24         *(ctrl_ptr + i) |= PORT_PULLUPEN_bm;
25     }
26
27     PORTC.PIN0CTRL |= PORT_PULLUPEN_bm;
28     PORTC.PIN1CTRL |= PORT_PULLUPEN_bm;
29
30     while (1)
31     {
32         PORTD.OUT = (PORTA.IN | PORTA_INPUT_CONFIGURATION_gc) | (PORTC.IN |  

33             PORTC_INPUT_CONFIGURATON_gc);
34     }
35
36
```

```
1  /*
2  * read_modify_write_sftw_sw0.c
3  *
4  * Created: 2/18/2021 6:37:20 PM
5  * Author : Judah Ben-Eliezer
6  */
7
8  #include <avr/io.h>
9
10 #define PORTA_INPUT_CONFIGURATION_gc 0x03
11 #define PORTC_INPUT_CONFIGURATON_gc 0xFC
12 #define PORTD_OUTPUT_CONFIGURATION_gc 0xFF
13
14 int main(void)
15 {
16
17     PORTA_DIR  &= PORTA_INPUT_CONFIGURATION_gc;
18     PORTC_DIR  &= PORTC_INPUT_CONFIGURATON_gc;
19     PORTD_DIR  |= PORTD_OUTPUT_CONFIGURATION_gc;
20     PORTB_DIR  &= ~PIN3_bm;
21
22     uint8_t* ctrl_ptr = (uint8_t*)&PORTA_PIN2CTRL;
23
24     for (uint8_t i = 0; i < 6; ++i) {
25         *(ctrl_ptr + i) |= PORT_PULLUPEN_bm;
26     }
27
28     PORTC_PIN0CTRL |= PORT_PULLUPEN_bm;
29     PORTC_PIN1CTRL |= PORT_PULLUPEN_bm;
30
31     uint8_t out;
32
33     while (1)
34     {
35         out = (PORTA_IN | PORTA_INPUT_CONFIGURATION_gc) & (PORTC_IN | PORTC_INPUT_CONFIGURATON_gc);
36         PORTD_OUT = (PORTB_IN & PIN3_bm) ? (out | 0x3C) & ((out << 2) | 0xC3): out;
37     }
38 }
39
```

```
1  /*
2  * two_to_four_decoder_bitwise_C_ops.c
3  *
4  * Created: 2/18/2021 7:21:01 PM
5  * Author : Judah Ben-Eliezer
6  */
7
8  #include <avr/io.h>
9
10 #define INPUT_gc 0x1F;
11 #define OUTPUT_gc 0x0F;
12
13 int main(void)
14 {
15
16     PORTA_DIR &= INPUT_gc;
17     PORTD_DIR |= OUTPUT_gc;
18
19     uint8_t G_ = PORTA_IN | ~PIN7_bm, B = PORTA_IN | ~PIN6_bm, A = PORTA_IN | ↗
        ~PIN5_bm, Y0, Y1, Y2, Y3;
20
21     while (1)
22     {
23         Y0 = (G_ | (((A << 1) | B) << 1) >> 7) | 0xFE;
24         Y1 = (G_ | (((~A << 1) | B) << 1) >> 6) | 0xFD;
25         Y2 = (G_ | (((A << 1) | ~B) << 1) >> 5) | 0xFB;
26         Y3 = (G_ | (((~A << 1) | ~B) << 1) >> 4) | 0xF7;
27
28         PORTD_OUT = Y0 & Y1 & Y2 & Y3;
29
30     }
31 }
32
33
```

```
1  /*
2   * sws_level_bargraph.c
3   *
4   * Created: 2/18/2021 8:10:39 PM
5   * Author : Judah Ben-Eliezer
6   */
7
8  #include <avr/io.h>
9
10
11  int main(void)
12  {
13      uint8_t* ptr = (uint8_t*) &PORTA.PIN2CTRL;
14
15      uint8_t switches, leds;
16
17      PORTD.DIR |= 0xFF;
18      PORTA.DIR &= 0x03;
19      PORTC.DIR &= 0xFC;
20
21      for (uint8_t i = 0; i < 6; ++i) {
22          *(ptr + i) |= PORT_PULLUPEN_bm;
23      }
24
25      PORTC.PIN0CTRL |= PORT_PULLUPEN_bm;
26      PORTC.PIN1CTRL |= PORT_PULLUPEN_bm;
27
28      while (1)
29      {
30          switches = (PORTA.IN & 0xFC) | (PORTC.IN & 0x03);
31          leds = 0x00;
32
33          for (uint8_t i = 0; i < 8; ++i, switches >>= 1) {
34              if (switches & 0x01) {
35                  leds <<= 1;
36                  leds |= 1;
37              }
38          }
39          PORTB.OUT = ~leds;
40      }
41  }
42
43
```