```c
/*
 * xor3_logic_ops.c
 *
 * Created: 2/6/2022 4:02:10 PM
 * Author : jason
 */

#include <avr/io.h>


int main(void)
{

    //pointer to PIN5CTRL array of pin configuration registers
    uint8_t* ptr = (uint8_t*)&PORTA.PIN2CTRL;

    //DIR is what configure the port pins as inputs or outputs
    VPORTA_DIR = 0x00;  //Configure PORTA pins ( PA7, PA6, PA5) as the inputs

    VPORTD_DIR = PIN7_bm;   //Configure (PD7) as output pin

    /*
    PA7 is "C"
    PA6 is "B"
    PA5 is "A"
    PD7 is "F"
    */

    //Configure PA7 - PA5 as input buffers with internal pull up resistors
    for(uint8_t i = 3; i < 8; i++){
        *(ptr + i) |= PORT_PULLUPEN_bm;
    }

    while (1)
    {
        uint8_t C = PORTA_IN & PIN7_bm;
        uint8_t B = (PORTA_IN & PIN6_bm) << 1;   //Shift left by 1 to bit 6 compare
          the bit 5 position (B) to bit 4 position (A)
        uint8_t A = (PORTA_IN & PIN5_bm) << 2;  //Shift left by 1 to compare the bit 5
           position (B) to bit 4 position (A)
        //Aligns the bit 7, bit 6 and bit 5 positions to compare


        PORTD_OUT = (((~C) ^ (~B) ^ (A)) ^ 0xFF ) | (((~C) ^ (B) ^ (~A)) ^ 0xFF ) |
          ( ((C) ^ (~B) ^ (~A)) ^ 0xFF) | (((C) ^ (B) ^ (A)) ^ 0xFF );

        //if(F){
        //  PORTD_OUT &= ~PIN7_bm;  //Turn on LED if F is 1
        //}
        //else{
        //  PORTD_OUT |= PIN7_bm;   //Turn off LED if F is 0;
        //}
```

```
/*
// If PA7 is "C" = 0 | PA6 is "B" = 0 | PA5 is "A" = 0 | PD7 is "F" = 0
//Meaning PA7: pressed | PA6: pressed | PA5: pressed | PD7: LED off (logic 1)
if((~(VPORTA_IN & PIN7_bm)) && (~(VPORTA_IN & PIN6_bm)) && (~(VPORTA_IN &
  PIN5_bm))){
    PORTD_OUT |= PIN7_bm;  //Set PD7 to 1 to turn off LED (logic 0)
}

// If PA7 is "C" = 0 | PA6 is "B" = 0 | PA5 is "A" = 1 | PD7 is "F" = 1
//Meaning PA7: pressed | PA6: pressed | PA5: not pressed | PD7: LED on (logic
  0)
else if((~(VPORTA_IN & PIN7_bm)) && (~(VPORTA_IN & PIN6_bm)) && ((VPORTA_IN &
  PIN5_bm))){
    PORTD_OUT &= ~PIN7_bm;  //Clear PD7 to 0 to turn off LED (logic 0)
}

// If PA7 is "C" = 0 | PA6 is "B" = 1 | PA5 is "A" = 0 | PD7 is "F" = 1
//Meaning PA7: pressed | PA6: not pressed | PA5: pressed | PD7: LED on (send
  logic 0)
else if((~(VPORTA_IN & PIN7_bm)) && ((VPORTA_IN & PIN6_bm)) && (~(VPORTA_IN &
  PIN5_bm))){
    PORTD_OUT &= ~PIN7_bm;  //Clear PD7 to 0 to turn off LED (logic 0)
}

// If PA7 is "C" = 0 | PA6 is "B" = 1 | PA5 is "A" = 1 | PD7 is "F" = 0
//Meaning PA7: pressed | PA6: not pressed | PA5: not pressed | PD7: LED off
  (send logic 1)
else if((~(VPORTA_IN & PIN7_bm)) && ((VPORTA_IN & PIN6_bm)) && ((VPORTA_IN &
  PIN5_bm))){
    PORTD_OUT |= PIN7_bm;  //Set PD7 to 0 to turn off LED (logic 0)
}

// If PA7 is "C" = 1 | PA6 is "B" = 0 | PA5 is "A" = 0 | PD7 is "F" = 1
//Meaning PA7: not pressed | PA6: pressed | PA5: pressed | PD7: LED on (send
  logic 0)
else if(((VPORTA_IN & PIN7_bm)) && (~(VPORTA_IN & PIN6_bm)) && (~(VPORTA_IN &
  PIN5_bm))){
    PORTD_OUT &= ~PIN7_bm;  //Set PD7 to 0 to turn off LED (logic 0)
}
```

```
        // If PA7 is "C" = 1 | PA6 is "B" = 0 | PA5 is "A" = 1 | PD7 is "F" = 0
        //Meaning PA7: not pressed | PA6: pressed | PA5: not pressed | PD7: LED off
          (send logic 1)
        else if(((VPORTA_IN & PIN7_bm)) && (~(VPORTA_IN & PIN6_bm)) && ((VPORTA_IN &
          PIN5_bm))){
            PORTD_OUT |= PIN7_bm;  //Set PD7 to 0 to turn off LED (logic 0)
        }

        // If PA7 is "C" = 1 | PA6 is "B" = 1 | PA5 is "A" = 0 | PD7 is "F" = 0
        //Meaning PA7: not pressed | PA6: pressed | PA5: not pressed | PD7: LED off
          (send logic 1)
        else if(((VPORTA_IN & PIN7_bm)) && ((VPORTA_IN & PIN6_bm)) && (~(VPORTA_IN &
          PIN5_bm))){
            PORTD_OUT |= PIN7_bm;  //Set PD7 to 1 to turn off LED (logic 0)
        }

        // If PA7 is "C" = 1 | PA6 is "B" = 1 | PA5 is "A" = 1 | PD7 is "F" = 1
        //Meaning PA7: not pressed | PA6: not pressed | PA5: not pressed | PD7: LED on
           (send logic 0)
        else if(((VPORTA_IN & PIN7_bm)) && ((VPORTA_IN & PIN6_bm)) && ((VPORTA_IN &
          PIN5_bm))){
            PORTD_OUT &= ~PIN7_bm;  //Set PD7 to 1 to turn off LED (logic 0)
        }
        */

    }
}
```