

## Laboratory 10: Interrupts

### Problem 19:

Simulate the following program in MPLAB.

- Use the stimulus to change the value of the pin RB0
- Which interrupt occurs?
- What is the value of the program counter after the interrupt occurs?
- What is the content of the stack after the interrupt occurs?
- What is the value of the GIE flag after the interrupt occurs?

```
LIST    P=16F84A
INCLUDE "P16f84A.INC"
__config _CP_OFF&_WDT_OFF&_XT_OSC
org     0x00;
goto   main
org     0x04;
goto   my_ISR
main
    bsf    STATUS,RPO;
    movlw  b'00000001';
    movwf  TRISB;
    bcf    OPTION_REG, INTEDG;
    bcf    STATUS,RPO;
    clrf   PORTB;
    bsf    INTCON,GIE;
    bsf    INTCON,INTE;
    bcf    INTCON,INTF;
loop    nop;
        nop;
        nop;
        nop;
        goto loop;
my_ISR
    bcf    INTCON, INTF;
    nop;
    nop;
    nop;
    nop;
    retfie;
end
```

**Problem 20:**

Simulate the following program in MPLAB.

- Generate one external interrupt using the stimulus.
- Why does the program enter an infinite loop? Explain!

```
LIST    P=16F84A
INCLUDE "P16f84A.INC"
_config _CP_OFF&_WDT_OFF&_XT_OSC
org     0x00;
goto   main
org     0x04;
main
    bsf    STATUS,RPO;
    movlw  b'00000001';
    movwf  TRISB;
    bcf    OPTION_REG, INTEDG;
    bcf    STATUS,RPO;
    clrf   PORTB;
    bsf    INTCON,GIE;
    bsf    INTCON,INTE;
    bcf    INTCON,INTF;
loop   nop;
        nop;
        nop;
        nop;
        goto loop;
my_ISR
    bcf    INTCON, INTF;
    nop;
    nop;
    nop;
    nop;
    retfie;
end
```

**Problem 21:**

Simulate the following program in MPLAB.

- Generate one external interrupt using the stimulus.
- Why does the program enter an infinite loop? Explain! What is the difference to Problem 20?

```
LIST    P=16F84A
INCLUDE "P16f84A.INC"
_config _CP_OFF&_WDT_OFF&_XT_OSC
org     0x00;
goto    main
org     0x04;
goto    my_ISR
main
    bsf   STATUS,RPO;
    movlw b'00000001';
    movwf TRISB;
    bcf   OPTION_REG, INTEDG;
    bcf   STATUS,RPO;
    clrf  PORTB;
    bsf   INTCON,GIE;
    bsf   INTCON,INTE;
    bcf   INTCON,INTF;
loop    nop;
        nop;
        nop;
        nop;
        goto loop;
my_ISR
    bcf   INTCON, INTF;
    nop;
    nop;
    nop;
    nop;
    retfie;
end
```

**Problem 22:**

Consider the program from the lecture: "Write a program that turns on a LED at pin RB1 if an external interrupt occurs (rising edge) and turn off the LED at RB1 if a PORTB interrupt on change happens."

- a. Simulate the program in MPLAB and generate the interrupts using the stimulus.
- b. Simulate the program using Proteus. Generate the interrupts using buttons connected to RB0 and RB7.