

**ECE 425 Introductions to Microprocessors**  
**Laboratory Work 5**

**Objective:**

- 1) Status register flags.
- 2) Subtration and addition commands.
- 3) Swap command.

**Preparation:** No preparation.

**Laboratory Work:**

- 1) The following command do not affect the Z flag of the STATUS register  
movlw k                      movwf f                      swapf f, d
- 2) The following command affect the Z flag of the STATUS register,  
movf f, d                      clrf f
- 3) The following program segment clears the memory location 0x0C without affecting the Z flag of the STATUS register.

```
LIST P=16F84A
INCLUDE "P16f84A.INC"

__config __CP_OFF&_WDT_OFF&_XT_OSC

Counter                      equ    0x0C ; free RAM location 12

movlw 0;
movwf Counter;
nop;
loop goto loop;

end
```

Inspect the above program segment.

- 4) The following program segment clear the memory location location 0x0C affecting the Z flag of the STATUS register. Inspect the program segment below.

```
LIST P=16F84A
INCLUDE "P16f84A.INC"

__config __CP_OFF&_WDT_OFF&_XT_OSC

Counter                      equ    0x0C ; free RAM location 12

clrf Counter;
nop;
loop goto loop;

end
```

- 5) The following program transfers the content of 0x0C to PORTB without affecting the Z flag of the STATUS register.

```
LIST P=16F84A
INCLUDE "P16f84A.INC"

__config __CP_OFF&_WDT_OFF&_XT_OSC
; set PORTB as output port
Counter      equ    0x0C ; free RAM location 12
movlw 0xF0; does not affect Z-flag
movwf 0x0C;  location 0x0C contains 0xF0, does not affect Z-flag

swaph 0x0C, F; does not affect Z-flag
swaph 0x0C, W; does not affect Z-flag
movwf PORTB; does not affect Z-flag

nop;
loop goto loop;
end
```

Explain each sentence of the above program segment.

The following commands affect the carry-borrow flag of the STATUS register,

addwf f, d    subwf f, d    addlw k    sublw k

- 6) Trace the following program and see how half carry flag of the STATUS register is affected.

```
LIST P=16F84A
INCLUDE "P16f84A.INC"

__config __CP_OFF&_WDT_OFF&_XT_OSC

bcf STATUS, 0;
bcf STATUS, 1;
bcf STATUS, 2;

movlw 0x0F; does not affect Z-C-DC-flag

addlw .1; affects all the flags

nop;

loop goto loop;
end
```

- 7) Trace the following program and see how carry flag of the STATUS register is affected. Note the content of the working register.

```
LIST P=16F84A
INCLUDE "P16f84A.INC"

__config __CP_OFF&__WDT_OFF&__XT_OSC

bcf STATUS, 0; clear zero flag
bcf STATUS, 1; clear half-carry flag
bcf STATUS, 2; clear carry flag

movlw 0x01;
sublw .0; a borrow is needed, carry flag is reset

nop;
loop goto loop;
end
```

- 8) Trace the following program and see how Z-DC-C flags of the STATUS register are affected. Note the content of the working register

```
LIST P=6F84A
INCLUDE "P16f84A.INC"
__config __CP_OFF&__WDT_OFF&__XT_OSC

bsf STATUS, RP0;
clrf TRISB;
bcf STATUS, RP0;
clrf PORTB;

bcf STATUS, 0;
bcf STATUS, 1;
bcf STATUS, 2;

movlw 0xFF;
addlw .1;
nop;

movwf PORTB;
loop goto loop;
end
```

- 9) Trace the following program and see how Z-DC-C flags of the STATUS register are affected. Note the content of the working register.

```
LIST P=16F84A
INCLUDE "P16f84A.INC"

__config _CP_OFF&_WDT_OFF&_XT_OSC

bcf STATUS,0;
bcf STATUS,1;
bcf STATUS,2;

movlw 0xFF; does not affect Z-C-DC-flag

addlw .1; affects all the flags

bcf STATUS,1; clear half carry flag
bcf STATUS,0; clear zero flag
nop;

movlw .1; affects all the flags
sublw .0;

nop;

loop goto loop;
end
```

**During your LAB work show every step that you complete to the LAB assistant. Get a copy of assembly files you write during the LAB hour via a flash disk for future reference.**