

## Experiment Number 4

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Branch ::	CSE - IoT	Sec/Grp ::	1/A
Semester ::	5 <sup>th</sup>	Date ::	14 <sup>th</sup> Oct, 2021
Subject ::	Embedded System Lab	CODE ::	CSD-333

### 1. Aim :

To examine the flag bits of status register.

### 2. Task :

1. Write an assembly program to add the following data and use the simulator to examine the various flag like carry, digital carry and zero flag after the execution of each addition. 99H, 01H, 66H, 89h, 97H, 35H.
2. Write assembly program to load the value into file registers from 20H to 24H location. Use the compliment command in each location and then use the simulator to examine the status of flag and file register content after the execution of each instruction.

### 3A. Algorithm :

- Create a new file
- Write the header file
- Write the starting location
- Move the literal value to the working register
- Move the working register to file register
- Now, Complement the file register
- Repeat Step 5 and Step 6 for every literal value until you reach the end using different values to move from working register to file register and the complement that file register.

MPLAB X IDE v5.50 - EXP\_4\_4525 : default

File Edit View Navigate Source Refactor Production Debug Team Tools Window Help

PC: 0x0 n ov z dc c : W:0x99 : bank 0

Projects x

EXP\_4\_4525

- Header Files
- Important Files
- Linker Files
- main.asm [-/M]
- Source Files
- Libraries
- Loadables

EXP\_4\_4525 - Dashboard x

EXP\_4\_4525

- Project Type: Appl
- Device: PIC18F4520
- Checksum: De
- CRC32: 0x977
- Packs: PIC18Fxxx\_Df
- Compiler Toolchai
- C18 (v3.47) [/o
- Debug Image:
- Memory: Data 1,536 (0x
- Data Used: Program 32,76
- Program U
- Debug Tool
- Simulator
- Click for Simula
- Debug Resource

main.asm [-/M] Disassembly x

Asm Source History

```

1 ! MOVLW 99H
2 0x0: MOVLW 0x99
3 ! MOVWF 01H
4 0x2: MOVWF 0x1, ACCESS
5 ! COMF 01H
6 0x4: COMF 0x1, F, ACCESS
7 ! MOVWF 66H
8 0x6: MOVWF 0x66, ACCESS
9 ! COMF 66H
10 0x8: COMF 0x66, F, ACCESS
11 ! MOVWF 89H

```

Output SFRs x

Address	Name	Hex	Decimal	Binary	Char
FCA	T2CON	0x00	0	00000000	?
FCD	T1CON	0x00	0	00000000	?
FD5	T0CON	0xFF	255	11111111	?
FFC	STKPTR	0x00	0	00000000	?
FD8	STATUS	0x00	0	00000000	?
FC7	SSPSTAT	0x00	0	00000000	?
FC5	SS [STATUS]	4 3 2 1 0	00000000	?	?
FC6	SS	N OV Z DC C	00000000	?	?
FC9	SS	0 0 0 0 0	00000000	?	?
FC8	SSPAD0	0x00	0	00000000	?
FB0	SPBRGH	0x00	0	00000000	?
FAF	SPBRG	0x00	0	00000000	?
FAB	RCSTA	0x00	0	00000000	?
FAE	RCREG	0x00	0	00000000	?
FD0	RCON	0x5C	92	01011100	?

Memory SFRs Format Individual

EXP\_4\_4525 (Build, Load, ...) debugger halted 2:1 INS

MPLAB X IDE v5.50 - EXP\_4\_4525 : default

File Edit View Navigate Source Refactor Production Debug Team Tools Window Help

default

PC: 0x2 n ov z dc c : W:0x99 : bank 0

Projects

- EXP\_4\_4525
  - Header Files
  - Important Files
  - Linker Files
  - main.asm [-/M]
  - Source Files
  - Libraries
  - Loadables

EXP\_4\_4525 - Dashboard

- EXP\_4\_4525
  - Project Type: Appl
  - Device
  - PIC18F4520
  - Checksum: De
  - CRC32: 0x977
  - Packs
  - PIC18Fxxx.Df
  - Compiler Toolchai
  - C18 (v3.47) [/o
  - Debug Image:
  - Memory
    - Data 1,536 (0x
    - 0x
    - Data Used:
    - Program 32,76
    - 0x
    - Program U
  - Debug Tool
  - Simulator
  - Click for Simul
  - Click for Simul

main.asm [-/M] Disassembly

Asm Source History

```

1 ! MOV LW 99H
2 0x0: MOV LW 0x99
3 ! MOV WF 01H
4 0x2: MOV WF 0x1, ACCESS
5 ! COMF 01H
6 0x4: COMF 0x1, F, ACCESS
7 ! MOV WF 66H
8 0x6: MOV WF 0x66, ACCESS
9 ! COMF 66H
10 0x8: COMF 0x66, F, ACCESS
11 ! MOV WF 89H
  
```

Output SFRs

Address	Name	Hex	Decimal	Binary	Char
FCA	T2CON	0x00	0	00000000	?
FCD	T1CON	0x00	0	00000000	?
FD5	T0CON	0xFF	255	11111111	?
FFC	STKPTR	0x00	0	00000000	?
FD8	STATUS	0x00	0	00000000	?
FC7	SSPSTAT	0x00	0	00000000	?
FC5	SS [STATUS]	4 3 2 1 0	00000000	00000000	?
FC6	SS	N OV Z DC C	00000000	00000000	?
FC9	SS	0 0 0 0 0	00000000	00000000	?
FC8	SSPADU	0x00	0	00000000	?
FB0	SPBRGH	0x00	0	00000000	?
FAF	SPBRG	0x00	0	00000000	?
FAB	RCSTA	0x00	0	00000000	?
FAE	RCREG	0x00	0	00000000	?
FD0	RCON	0x5C	92	01011100	?

Memory SFRs Format Individual

User program stopped

EXP\_4\_4525 (Build, Load, ...) debugger halted 4:1 INS

MPLAB X IDE v5.50 - EXP\_4\_4525 : default

File Edit View Navigate Source Refactor Production Debug Team Tools Window Help

default

PC: 0x4 n ov z dc c : W:0x99 : bank 0

Projects

- EXP\_4\_4525
  - Header Files
  - Important Files
  - Linker Files
  - main.asm [-/M]
  - Source Files
  - Libraries
  - Loadables

EXP\_4\_4525 - Dashboard

- EXP\_4\_4525
  - Project Type: Appl
  - Device
  - PIC18F4520
  - Checksum: De
  - CRC32: 0x977
  - Packs
  - PIC18Fxxx.Df
  - Compiler Toolchai
  - C18 (v3.47) [/o
  - Debug Image:
  - Memory
    - Data 1,536 (0x
    - 0x
    - Data Used:
    - Program 32,76
    - 0x
    - Program U
  - Debug Tool
  - Simulator
  - Click for Simul
  - Click for Simul

main.asm [-/M] Disassembly

Asm Source History

```

1 ! MOV LW 99H
2 0x0: MOV LW 0x99
3 ! MOV WF 01H
4 0x2: MOV WF 0x1, ACCESS
5 ! COMF 01H
6 0x4: COMF 0x1, F, ACCESS
7 ! MOV WF 66H
8 0x6: MOV WF 0x66, ACCESS
9 ! COMF 66H
10 0x8: COMF 0x66, F, ACCESS
11 ! MOV WF 89H
  
```

Output SFRs

Address	Name	Hex	Decimal	Binary	Char
FCA	T2CON	0x00	0	00000000	?
FCD	T1CON	0x00	0	00000000	?
FD5	T0CON	0xFF	255	11111111	?
FFC	STKPTR	0x00	0	00000000	?
FD8	STATUS	0x00	0	00000000	?
FC7	SSPSTAT	0x00	0	00000000	?
FC5	SS [STATUS]	4 3 2 1 0	00000000	00000000	?
FC6	SS	N OV Z DC C	00000000	00000000	?
FC9	SS	0 0 0 0 0	00000000	00000000	?
FC8	SSPADU	0x00	0	00000000	?
FB0	SPBRGH	0x00	0	00000000	?
FAF	SPBRG	0x00	0	00000000	?
FAB	RCSTA	0x00	0	00000000	?
FAE	RCREG	0x00	0	00000000	?
FD0	RCON	0x5C	92	01011100	?

Memory SFRs Format Individual

User program stopped

EXP\_4\_4525 (Build, Load, ...) debugger halted 6:1 INS

MPLAB X IDE v5.50 - EXP\_4\_4525 : default

File Edit View Navigate Source Refactor Production Debug Team Tools Window Help

default

PC: 0x6 n ov z dc c : W:0x99 : bank 0

Projects x

- EXP\_4\_4525
  - Header Files
  - Important Files
  - Linker Files
  - main.asm [-/M]
  - Source Files
  - Libraries
  - Loadables

EXP\_4\_4525 - Dashboard x

- EXP\_4\_4525
  - Project Type: Appl
  - Device
  - PIC18F4520
  - Checksum: De
  - CRC32: 0x977
  - Packs
  - PIC18Fxxx.Df
  - Compiler Toolchai
  - C18 (v3.47) [/o
  - Debug Image:
  - Memory
    - Data 1,536 (0x
    - 0x
    - Data Used:
    - Program 32,76
    - 0x
    - Program U
  - Debug Tool
  - Simulator
  - Click for Simul
  - Debug Resource

main.asm [-/M] x Disassembly x

Asm Source History

```

0x0: MOVWF 0x99
1 ! MOVWF 01H
2 0x2: MOVWF 0x1, ACCESS
3 ! COMF 01H
4 0x4: COMF 0x1, F, ACCESS
5 ! MOVWF 66H
6 0x6: MOVWF 0x66, ACCESS
7 ! COMF 66H
8 0x8: COMF 0x66, F, ACCESS
9 ! MOVWF 89H
10 0xA: MOVWF 0x89, BANKED

```

Output SFRs x

Address	Name	Hex	Decimal	Binary	Char
FCA	T2CON	0x00	0	00000000	?
FCD	T1CON	0x00	0	00000000	?
FD5	T0CON	0xFF	255	11111111	?
FFC	STKPTR	0x00	0	00000000	?
FD8	STATUS	0x00	0	00000000	?
FC7	SSPSTAT	0x00	0	00000000	?
FC5	SS [STATUS]	4 3 2 1 0	00000000	?	?
FC6	SS	N OV Z DC C	00000000	?	?
FC9	SS	0 0 0 0 0	00000000	?	?
FC8	SSPADD	0x00	0	00000000	?
FB0	SPBRGH	0x00	0	00000000	?
FAF	SPBRG	0x00	0	00000000	?
FAB	RCSTA	0x00	0	00000000	?
FAE	RCREG	0x00	0	00000000	?
FD0	RCON	0x5C	92	01011100	?

Memory SFRs Format Individual

User program stopped

EXP\_4\_4525 (Build, Load, ...) debugger halted 8:1 INS

MPLAB X IDE v5.50 - EXP\_4\_4525 : default

File Edit View Navigate Source Refactor Production Debug Team Tools Window Help

default

PC: 0x8 n ov z dc c : W:0x99 : bank 0

Projects x

- EXP\_4\_4525
  - Header Files
  - Important Files
  - Linker Files
  - main.asm [-/M]
  - Source Files
  - Libraries
  - Loadables

EXP\_4\_4525 - Dashboard x

- EXP\_4\_4525
  - Project Type: Appl
  - Device
  - PIC18F4520
  - Checksum: De
  - CRC32: 0x977
  - Packs
  - PIC18Fxxx.Df
  - Compiler Toolchai
  - C18 (v3.47) [/o
  - Debug Image:
  - Memory
    - Data 1,536 (0x
    - 0x
    - Data Used:
    - Program 32,76
    - 0x
    - Program U
  - Debug Tool
  - Simulator
  - Click for Simul
  - Debug Resource

main.asm [-/M] x Disassembly x

Asm Source History

```

4 0x2: MOVWF 0x1, ACCESS
5 ! COMF 01H
6 0x4: COMF 0x1, F, ACCESS
7 ! MOVWF 66H
8 0x6: MOVWF 0x66, ACCESS
9 ! COMF 66H
10 0x8: COMF 0x66, F, ACCESS
11 ! MOVWF 89H
12 0xA: MOVWF 0x89, BANKED
13 ! COMF 89H
14 0xC: COMF 0x89, F, BANKED

```

Output SFRs x

Address	Name	Hex	Decimal	Binary	Char
FCA	T2CON	0x00	0	00000000	?
FCD	T1CON	0x00	0	00000000	?
FD5	T0CON	0xFF	255	11111111	?
FFC	STKPTR	0x00	0	00000000	?
FD8	STATUS	0x00	0	00000000	?
FC7	SSPSTAT	0x00	0	00000000	?
FC5	SSPCON2	0x00	0	00000000	?
FC6	SSPCON1	0x00	0	00000000	?
FC9	SSPBUF	0x00	0	00000000	?
FC8	SSPADD	0x00	0	00000000	?
FB0	SPBRGH	0x00	0	00000000	?
FAF	SPBRG	0x00	0	00000000	?
FAB	RCSTA	0x00	0	00000000	?
FAE	RCREG	0x00	0	00000000	?
FD0	RCON	0x5C	92	01011100	?

Memory SFRs Format Individual

User program stopped

EXP\_4\_4525 (Build, Load, ...) debugger halted 10:1 INS

MPLAB X IDE v5.50 - EXP\_4\_4525 : default

File Edit View Navigate Source Refactor Production Debug Team Tools Window Help

default

PC: 0xA n ov z dc c : W:0x99 : bank 0

Projects x

- EXP\_4\_4525
  - Header Files
  - Important Files
  - Linker Files
  - main.asm [-/M]
  - Source Files
  - Libraries
  - Loadables

EXP\_4\_4525 - Dashboard x

- EXP\_4\_4525
  - Project Type: Appl
  - Device
  - PIC18F4520
  - Checksum: De
  - CRC32: 0x977
  - Packs
  - PIC18Fxxx.Df
  - Compiler Toolchai
  - C18 (v3.47) [/o
  - Debug Image:
  - Memory
  - Data 1,536 (0x
  - Data Used:
  - Program 32,76
  - Program U
  - Debug Tool
  - Simulator
  - Click for Simul
  - Debug Resource

main.asm [-/M] x Disassembly x

Asm Source History

```

6 0x4: COMF 0x1, F, ACCESS
7 ! MOVWF 66H
8 0x6: MOVWF 0x66, ACCESS
9 ! COMF 66H
10 0x8: COMF 0x66, F, ACCESS
11 ! MOVWF 89H
12 0xA: MOVWF 0x89, BANKED
13 ! COMF 89H
14 0xC: COMF 0x89, F, BANKED
15 ! MOVWF 97H
16 0xE: MOVWF 0x97, BANKED

```

Output SFRs x

Address	Name	Hex	Decimal	Binary	Char
FCA	T2CON	0x00	0	00000000	?
FCD	T1CON	0x00	0	00000000	?
FD5	T0CON	0xFF	255	11111111	?
FFC	STKPTR	0x00	0	00000000	?
FD8	STATUS	0x00	0	00000000	?
FC7	SS	[STATUS]	4 3 2 1 0	00000000	?
FC5	SS	N OV Z DC C	00000000	00000000	?
FC6	SS	0 0 0 0 0	00000000	00000000	?
FC9	SS	0 0 0 0 0	00000000	00000000	?
FC8	SSPADD	0x00	0	00000000	?
FB0	SPBRGH	0x00	0	00000000	?
FAF	SPBRG	0x00	0	00000000	?
FAB	RCSTA	0x00	0	00000000	?
FAE	RCREG	0x00	0	00000000	?
FD0	RCON	0x5C	92	01011100	?

Memory SFRs Format Individual

User program stopped

EXP\_4\_4525 (Build, Load, ...) debugger halted 12:1 INS

MPLAB X IDE v5.50 - EXP\_4\_4525 : default

File Edit View Navigate Source Refactor Production Debug Team Tools Window Help

default

PC: 0xC n ov z dc c : W:0x99 : bank 0

Projects x

- EXP\_4\_4525
  - Header Files
  - Important Files
  - Linker Files
  - main.asm [-/M]
  - Source Files
  - Libraries
  - Loadables

EXP\_4\_4525 - Dashboard x

- EXP\_4\_4525
  - Project Type: Appl
  - Device
  - PIC18F4520
  - Checksum: De
  - CRC32: 0x977
  - Packs
  - PIC18Fxxx.Df
  - Compiler Toolchai
  - C18 (v3.47) [/o
  - Debug Image:
  - Memory
  - Data 1,536 (0x
  - Data Used:
  - Program 32,76
  - Program U
  - Debug Tool
  - Simulator
  - Click for Simul
  - Debug Resource

main.asm [-/M] x Disassembly x

Asm Source History

```

8 0x6: MOVWF 0x66, ACCESS
9 ! COMF 66H
10 0x8: COMF 0x66, F, ACCESS
11 ! MOVWF 89H
12 0xA: MOVWF 0x89, BANKED
13 ! COMF 89H
14 0xC: COMF 0x89, F, BANKED
15 ! MOVWF 97H
16 0xE: MOVWF 0x97, BANKED
17 ! COMF 97H
18 0x10: COMF 0x97, F, BANKED

```

Output SFRs x

Address	Name	Hex	Decimal	Binary	Char
FCA	T2CON	0x00	0	00000000	?
FCD	T1CON	0x00	0	00000000	?
FD5	T0CON	0xFF	255	11111111	?
FFC	STKPTR	0x00	0	00000000	?
FD8	STATUS	0x00	0	00000000	?
FC7	SS	[STATUS]	4 3 2 1 0	00000000	?
FC5	SS	N OV Z DC C	00000000	00000000	?
FC6	SS	0 0 0 0 0	00000000	00000000	?
FC9	SS	0 0 0 0 0	00000000	00000000	?
FC8	SSPADD	0x00	0	00000000	?
FB0	SPBRGH	0x00	0	00000000	?
FAF	SPBRG	0x00	0	00000000	?
FAB	RCSTA	0x00	0	00000000	?
FAE	RCREG	0x00	0	00000000	?
FD0	RCON	0x5C	92	01011100	?

Memory SFRs Format Individual

User program stopped

EXP\_4\_4525 (Build, Load, ...) debugger halted 14:1 INS

MPLAB X IDE v5.50 - EXP\_4\_4525 : default

File Edit View Navigate Source Refactor Production Debug Team Tools Window Help

default

PC: 0xE n ov z dc c : W:0x99 : bank 0

Projects x

- EXP\_4\_4525
  - Header Files
  - Important Files
  - Linker Files
  - main.asm [-/M]
  - Source Files
  - Libraries
  - Loadables

EXP\_4\_4525 - Dashboard x

- EXP\_4\_4525
  - Project Type: Appl
  - Device
  - PIC18F4520
  - Checksum: De
  - CRC32: 0x977
  - Packs
  - PIC18Fxxx.Df
  - Compiler Toolchai
  - C18 (v3.47) [/o
  - Debug Image:
  - Memory
    - Data 1,536 (0x
    - 0%
    - Data Used:
    - Program 32,76
    - 0%
    - Program U
  - Debug Tool
  - Simulator
  - Click for Simul
  - Click for Simul

main.asm [-/M] Disassembly x

Asm Source History

```

10 0x8: COMF 0x66, F, ACCESS
11 ! MOVWF 89H
12 0xA: MOVWF 0x89, BANKED
13 ! COMF 89H
14 0xC: COMF 0x89, F, BANKED
15 ! MOVWF 97H
16 0xE: MOVWF 0x97, BANKED
17 ! COMF 97H
18 0x10: COMF 0x97, F, BANKED
19 ! MOVWF 35H
20 0x12: MOVWF 0x35, ACCESS

```

Output SFRs x

Address	Name	Hex	Decimal	Binary	Char
FCA	T2CON	0x00	0	00000000	?
FCD	T1CON	0x00	0	00000000	?
FD5	T0CON	0xFF	255	11111111	?
FFC	STKPTR	0x00	0	00000000	?
FD8	STATUS	0x00	0	00000000	?
FC7	SS	[STATUS] 4 3 2 1 0	00000000	00000000	?
FC5	SS	N OV Z DC C	00000000	00000000	?
FC6	SS	0 0 0 0 0	00000000	00000000	?
FC9	SS	0 0 0 0 0	00000000	00000000	?
FC8	SSPADD	0x00	0	00000000	?
FB0	SPBRGH	0x00	0	00000000	?
FAF	SPBRG	0x00	0	00000000	?
FAB	RCSTA	0x00	0	00000000	?
FAE	RCREG	0x00	0	00000000	?
FD0	RCON	0x5C	92	01011100	?

Memory SFRs Format Individual

User program stopped

EXP\_4\_4525 (Build, Load, ...) debugger halted 16:1 INS

MPLAB X IDE v5.50 - EXP\_4\_4525 : default

File Edit View Navigate Source Refactor Production Debug Team Tools Window Help

default

PC: 0x10 n ov z dc c : W:0x99 : bank 0

Projects x

- EXP\_4\_4525
  - Header Files
  - Important Files
  - Linker Files
  - main.asm [-/M]
  - Source Files
  - Libraries
  - Loadables

EXP\_4\_4525 - Dashboard x

- EXP\_4\_4525
  - Project Type: Appl
  - Device
  - PIC18F4520
  - Checksum: De
  - CRC32: 0x977
  - Packs
  - PIC18Fxxx.Df
  - Compiler Toolchai
  - C18 (v3.47) [/o
  - Debug Image:
  - Memory
    - Data 1,536 (0x
    - 0%
    - Data Used:
    - Program 32,76
    - 0%
    - Program U
  - Debug Tool
  - Simulator
  - Click for Simul
  - Click for Simul

main.asm [-/M] Disassembly x

Asm Source History

```

16 0xE: MOVWF 0x97, BANKED
17 ! COMF 97H
18 0x10: COMF 0x97, F, BANKED
19 ! MOVWF 35H
20 0x12: MOVWF 0x35, ACCESS
21 ! COMF 35H
22 0x14: COMF 0x35, F, ACCESS
23

```

Output SFRs x

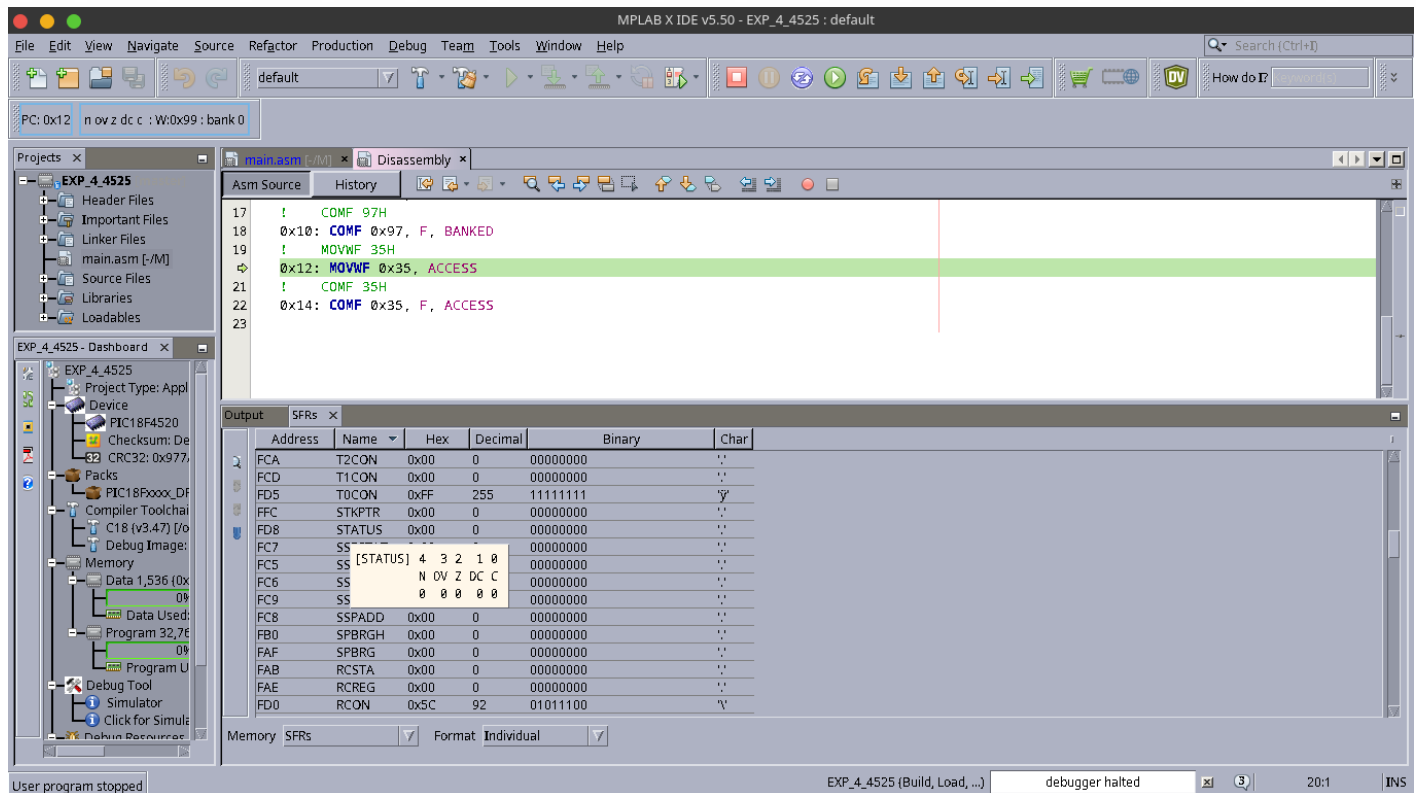
Address	Name	Hex	Decimal	Binary	Char
FCA	T2CON	0x00	0	00000000	?
FCD	T1CON	0x00	0	00000000	?
FD5	T0CON	0xFF	255	11111111	?
FFC	STKPTR	0x00	0	00000000	?
FD8	STATUS	0x00	0	00000000	?
FC7	SS	[STATUS] 4 3 2 1 0	00000000	00000000	?
FC5	SS	N OV Z DC C	00000000	00000000	?
FC6	SS	0 0 0 0 0	00000000	00000000	?
FC9	SS	0 0 0 0 0	00000000	00000000	?
FC8	SSPADD	0x00	0	00000000	?
FB0	SPBRGH	0x00	0	00000000	?
FAF	SPBRG	0x00	0	00000000	?
FAB	RCSTA	0x00	0	00000000	?
FAE	RCREG	0x00	0	00000000	?
FD0	RCON	0x5C	92	01011100	?

Memory SFRs Format Individual

User program stopped

EXP\_4\_4525 (Build, Load, ...) debugger halted 18:1 INS





### 3B. Algorithm :

- Create the new asm file
- Write the header file
- Write the starting location
- Move the literal value to the WREG
- Move the working register to the file register
- Now, load the value of file register from 20H to 24H
- Now, Complement the file register

MPLAB X IDE v5.50 - EXP\_4\_4525 : default

File Edit View Navigate Source Refactor Production Debug Team Tools Window Help

default

PC: 0x0 n ov z dc c : W:0x81 : bank 0

Projects

- EXP\_4\_4525
  - Header Files
  - Important Files
  - Linker Files
  - main.asm [-/M]
  - Source Files
  - Libraries
  - Loadables

EXP\_4\_4525 - Dashboard

- EXP\_4\_4525
  - Project Type: Appl
  - Device: PIC18F4520
  - Checksum: De
  - CRC32: 0xA52
  - Packs
  - PIC18Fxxxx\_DF
  - Compiler Toolchai
  - C18 (v3.47) [/o
  - Debug Image:
  - Memory
    - Data 1,536 (0x
    - Data Used:
    - Program 32,76
    - Program U
  - Debug Tool
  - Simulator
  - Click for Simul

main.asm [-/M] Disassembly

Asm Source History

```

1 ! MOV LW 81H
2 0x0: MOV LW 0x81
3 ! MOV WF 20H
4 0x2: MOV WF 0x20, ACCESS
5 ! MOV FF 20H, 21H
6 0x4: MOV FF 0x20, 0x21
7 0x6: NOP
8 ! MOV FF 20H, 22H
9 0x8: MOV FF 0x20, 0x22
10 0xA: NOP
11 ! MOV FF 20H, 23H
  
```

Output SFRs

Address	Name	Hex	Decimal	Binary	Char
FCE	TMR1L	0x00	0	00000000	..
FCF	TMR1H	0x00	0	00000000	..
FD0	RCON	0x5C	92	01011100	..
FD1	WDTCON	0x00	0	00000000	..
FD2	HLVDCON	0x05	5	00000101	..
FD3	OSCCON	0x40	64	01000000	..
FD5	T0CON	0xFF	255	11111111	..
FD6	TMR0	0x0000	0	00000000 00000000	..
FD6	TMR0L	0x00	0	00000000	..
FD7	TMR0H	0x00	0	00000000	..
FD8	STATUS	0x00	0	00000000	..
FD9	FSR2	0x0000	0	00000000 00000000	..
FD9	FS [STATUS]	4 3 2 1 0	00000000	..	..
FDA	FS	N OV Z DC C	00000000	..	..
FDB	PL	0 0 0 0 0	00000000	..	..

Memory SFRs Format Individual

EXP\_4\_4525 (Build, Load, ...) debugger halted 2:1 INS

MPLAB X IDE v5.50 - EXP\_4\_4525 : default

File Edit View Navigate Source Refactor Production Debug Team Tools Window Help

default

PC: 0x2 n ov z dc c : W:0x81 : bank 0

Projects

- EXP\_4\_4525
  - Header Files
  - Important Files
  - Linker Files
  - main.asm [-/M]
  - Source Files
  - Libraries
  - Loadables

EXP\_4\_4525 - Dashboard

- EXP\_4\_4525
  - Project Type: Appl
  - Device: PIC18F4520
  - Checksum: De
  - CRC32: 0xA52
  - Packs
  - PIC18Fxxxx\_DF
  - Compiler Toolchai
  - C18 (v3.47) [/o
  - Debug Image:
  - Memory
    - Data 1,536 (0x
    - Data Used:
    - Program 32,76
    - Program U
  - Debug Tool
  - Simulator
  - Click for Simul

main.asm [-/M] Disassembly

Asm Source History

```

1 ! MOV LW 81H
2 0x0: MOV LW 0x81
3 ! MOV WF 20H
4 0x2: MOV WF 0x20, ACCESS
5 ! MOV FF 20H, 21H
6 0x4: MOV FF 0x20, 0x21
7 0x6: NOP
8 ! MOV FF 20H, 22H
9 0x8: MOV FF 0x20, 0x22
10 0xA: NOP
11 ! MOV FF 20H, 23H
  
```

Output SFRs

Address	Name	Hex	Decimal	Binary	Char
FCE	TMR1L	0x00	0	00000000	..
FCF	TMR1H	0x00	0	00000000	..
FD0	RCON	0x5C	92	01011100	..
FD1	WDTCON	0x00	0	00000000	..
FD2	HLVDCON	0x05	5	00000101	..
FD3	OSCCON	0x40	64	01000000	..
FD5	T0CON	0xFF	255	11111111	..
FD6	TMR0	0x0000	0	00000000 00000000	..
FD6	TMR0L	0x00	0	00000000	..
FD7	TMR0H	0x00	0	00000000	..
FD8	STATUS	0x00	0	00000000	..
FD9	FSR2	0x0000	0	00000000 00000000	..
FD9	FS [STATUS]	4 3 2 1 0	00000000	..	..
FDA	FS	N OV Z DC C	00000000	..	..
FDB	PL	0 0 0 0 0	00000000	..	..

Memory SFRs Format Individual

EXP\_4\_4525 (Build, Load, ...) debugger halted 4:1 INS

User program stopped



MPLAB X IDE v5.50 - EXP\_4\_4525 : default

File Edit View Navigate Source Refactor Production Debug Team Tools Window Help

default

PC: 0x4 n ov z dc c : W:0x81 : bank 0

Projects

- EXP\_4\_4525
  - Header Files
  - Important Files
  - Linker Files
  - main.asm [-/M]
  - Source Files
  - Libraries
  - Loadables

EXP\_4\_4525 - Dashboard

- EXP\_4\_4525
  - Project Type: Appl
  - Device: PIC18F4520
  - Checksum: De
  - CRC32: 0xA52
  - Packs
  - PIC18Fxxx\_DF
  - Compiler Toolchai
  - C18 (v3.47) [/o
  - Debug Image:
  - Memory
    - Data 1,536 (0x
    - Data Used:
    - Program 32,76
    - Program U
  - Debug Tool
  - Simulator
  - Click for Simul

main.asm [L/M] Disassembly

Asm Source History

```

1 ! MOV LW 81H
2 0x0: MOV LW 0x81
3 ! MOV WF 20H
4 0x2: MOV WF 0x20, ACCESS
5 ! MOV FF 20H, 21H
6 0x4: MOV FF 0x20, 0x0
7 0x6: NOP
8 ! MOV FF 20H, 22H
9 0x8: MOV FF 0x20, 0x22
10 0xA: NOP
11 ! MOV FF 20H, 23H
  
```

Output SFRs

Address	Name	Hex	Decimal	Binary	Char
FCE	TMR1L	0x00	0	00000000	..
FCF	TMR1H	0x00	0	00000000	..
FD0	RCON	0x5C	92	01011100	..
FD1	WDTCON	0x00	0	00000000	..
FD2	HLVDCON	0x05	5	00000101	..
FD3	OSCCON	0x40	64	01000000	..
FD5	T0CON	0xFF	255	11111111	..
FD6	TMR0	0x0000	0	00000000 00000000	..
FD6	TMR0L	0x00	0	00000000	..
FD7	TMR0H	0x00	0	00000000	..
FD8	STATUS	0x00	0	00000000	..
FD9	FSR2	0x0000	0	00000000 00000000	..
FD9	FS [STATUS]	4 3 2 1 0		00000000	..
FDA	FS	N OV Z DC C		00000000	..
FDB	PL	0 0 0 0 0		00000000	..

Memory SFRs Format Individual

User program stopped

EXP\_4\_4525 (Build, Load, ...) debugger halted 6:1 INS

MPLAB X IDE v5.50 - EXP\_4\_4525 : default

File Edit View Navigate Source Refactor Production Debug Team Tools Window Help

default

PC: 0x8 n ov z dc c : W:0x81 : bank 0

Projects

- EXP\_4\_4525
  - Header Files
  - Important Files
  - Linker Files
  - main.asm [-/M]
  - Source Files
  - Libraries
  - Loadables

EXP\_4\_4525 - Dashboard

- EXP\_4\_4525
  - Project Type: Appl
  - Device: PIC18F4520
  - Checksum: De
  - CRC32: 0xA52
  - Packs
  - PIC18Fxxx\_DF
  - Compiler Toolchai
  - C18 (v3.47) [/o
  - Debug Image:
  - Memory
    - Data 1,536 (0x
    - Data Used:
    - Program 32,76
    - Program U
  - Debug Tool
  - Simulator
  - Click for Simul

main.asm [L/M] Disassembly

Asm Source History

```

3 ! MOV WF 20H
4 0x2: MOV WF 0x20, ACCESS
5 ! MOV FF 20H, 21H
6 0x4: MOV FF 0x20, 0x21
7 0x6: NOP
8 ! MOV FF 20H, 22H
9 0x8: MOV FF 0x20, 0x0
10 0xA: NOP
11 ! MOV FF 20H, 23H
12 0xC: MOV FF 0x20, 0x23
13 0xE: NOP
  
```

Output SFRs

Address	Name	Hex	Decimal	Binary	Char
FCE	TMR1L	0x00	0	00000000	..
FCF	TMR1H	0x00	0	00000000	..
FD0	RCON	0x5C	92	01011100	..
FD1	WDTCON	0x00	0	00000000	..
FD2	HLVDCON	0x05	5	00000101	..
FD3	OSCCON	0x40	64	01000000	..
FD5	T0CON	0xFF	255	11111111	..
FD6	TMR0	0x0000	0	00000000 00000000	..
FD6	TMR0L	0x00	0	00000000	..
FD7	TMR0H	0x00	0	00000000	..
FD8	STATUS	0x00	0	00000000	..
FD9	FSR2	0x0000	0	00000000 00000000	..
FD9	FS [STATUS]	4 3 2 1 0		00000000	..
FDA	FS	N OV Z DC C		00000000	..
FDB	PL	0 0 0 0 0		00000000	..

Memory SFRs Format Individual

User program stopped

EXP\_4\_4525 (Build, Load, ...) debugger halted 9:1 INS

MPLAB X IDE v5.50 - EXP\_4\_4525 : default

File Edit View Navigate Source Refactor Production Debug Team Tools Window Help

default

PC: 0xC n ov z dc c : W:0x81 : bank 0

Projects x

- EXP\_4\_4525
  - Header Files
  - Important Files
  - Linker Files
  - main.asm [-/M]
  - Source Files
  - Libraries
  - Loadables

EXP\_4\_4525 - Dashboard x

EXP\_4\_4525

Project Type: Appl

Device: PIC18F4520

Checksum: De

CRC32: 0xA52

Packs

PIC18Fxxx\_DF

Compiler Toolchai

C18 (v3.47) [/o

Debug Image:

Memory

- Data 1,536 (0x
- Data Used:
- Program 32,76
- Program U

Debug Tool

Simulator

Click for Simul

main.asm [L/M] x Disassembly x

Asm Source History

```

6 0x4: MOVFF 0x20, 0x21
7 0x6: NOP
8 ! MOVFF 20H, 22H
9 0x8: MOVFF 0x20, 0x22
10 0xA: NOP
11 ! MOVFF 20H, 23H
12 0xC: MOVFF 0x20, 0x0
13 0xE: NOP
14 ! MOVFF 20H, 24H
15 0x10: MOVFF 0x20, 0x24
16 0x12: NOP
  
```

Output SFRs x

Address	Name	Hex	Decimal	Binary	Char
FCE	TMR1L	0x00	0	00000000	..
FCF	TMR1H	0x00	0	00000000	..
FD0	RCON	0x5C	92	01011100	^
FD1	WDTCON	0x00	0	00000000	..
FD2	HLVDCON	0x05	5	00000101	..
FD3	OSCCON	0x40	64	01000000	@
FD5	T0CON	0xFF	255	11111111	^
FD6	TMR0	0x0000	0	00000000 00000000	..
FD6	TMR0L	0x00	0	00000000	..
FD7	TMR0H	0x00	0	00000000	..
FD8	STATUS	0x00	0	00000000	..
FD9	FSR2	0x0000	0	00000000 00000000	..
FD9	FS [STATUS]	4 3 2 1 0		00000000	..
FDA	FS	N OV Z DC C		00000000	..
FDB	PL	0 0 0 0 0		00000000	..

Memory SFRs Format Individual

User program stopped

EXP\_4\_4525 (Build, Load, ...) debugger halted 12:1 INS

MPLAB X IDE v5.50 - EXP\_4\_4525 : default

File Edit View Navigate Source Refactor Production Debug Team Tools Window Help

default

PC: 0x10 n ov z dc c : W:0x81 : bank 0

Projects x

- EXP\_4\_4525
  - Header Files
  - Important Files
  - Linker Files
  - main.asm [-/M]
  - Source Files
  - Libraries
  - Loadables

EXP\_4\_4525 - Dashboard x

EXP\_4\_4525

Project Type: Appl

Device: PIC18F4520

Checksum: De

CRC32: 0xA52

Packs

PIC18Fxxx\_DF

Compiler Toolchai

C18 (v3.47) [/o

Debug Image:

Memory

- Data 1,536 (0x
- Data Used:
- Program 32,76
- Program U

Debug Tool

Simulator

Click for Simul

main.asm [L/M] x Disassembly x

Asm Source History

```

12 0xC: MOVFF 0x20, 0x23
13 0xE: NOP
14 ! MOVFF 20H, 24H
15 0x10: MOVFF 0x20, 0x0
16 0x12: NOP
17 ! COMF 24H
18 0x14: COMF 0x24, F, ACCESS
19
  
```

Output SFRs x

Address	Name	Hex	Decimal	Binary	Char
FCE	TMR1L	0x00	0	00000000	..
FCF	TMR1H	0x00	0	00000000	..
FD0	RCON	0x5C	92	01011100	^
FD1	WDTCON	0x00	0	00000000	..
FD2	HLVDCON	0x05	5	00000101	..
FD3	OSCCON	0x40	64	01000000	@
FD5	T0CON	0xFF	255	11111111	^
FD6	TMR0	0x0000	0	00000000 00000000	..
FD6	TMR0L	0x00	0	00000000	..
FD7	TMR0H	0x00	0	00000000	..
FD8	STATUS	0x00	0	00000000	..
FD9	FSR2	0x0000	0	00000000 00000000	..
FD9	FS [STATUS]	4 3 2 1 0		00000000	..
FDA	FS	N OV Z DC C		00000000	..
FDB	PL	0 0 0 0 0		00000000	..

Memory SFRs Format Individual

User program stopped

EXP\_4\_4525 (Build, Load, ...) debugger halted 15:1 INS

MPLAB X IDE v5.50 - EXP\_4\_4525 : default

File Edit View Navigate Source Refactor Production Debug Team Tools Window Help

Search (Ctrl+F)

PC: 0x14 n ov 2 dc : W:0x81 : bank 0

Projects x

- EXP\_4\_4525
  - Header Files
  - Important Files
  - Linker Files
  - main.asm [-/M]
  - Source Files
  - Libraries
  - Loadables

EXP\_4\_4525 - Dashboard x

- EXP\_4\_4525
  - Project Type: Appl
  - Device
  - PIC18F4520
  - Checksum: De
  - CRC32: 0xA52
  - Packs
  - PIC18Fxxxx\_DF
  - Compiler Toolchai
  - C18 (v3.47) [/o
  - Debug Image:
  - Memory
    - Data 1,536 (0x
    - Data Used:
    - Program 32,76
    - Program U
  - Debug Tool
  - Simulator
  - Click for Simula

main.asm [-/M] x Disassembly x

Asm Source History

```

13 0xE: NOP
14 ! MOVFF 20H, 24H
15 0x10: MOVFF 0x20, 0x24
16 0x12: NOP
17 ! COMF 24H
18 0x14: COMF 0x24, F, ACCESS
19

```

Output SFRs x

Address	Name	Hex	Decimal	Binary	Char
FCE	TMR1L	0x00	0	00000000	''
FCF	TMR1H	0x00	0	00000000	''
FD0	RCON	0x5C	92	01011100	'\'
FD1	WDTCON	0x00	0	00000000	''
FD2	HLVDCON	0x05	5	00000101	''
FD3	OSCCON	0x40	64	01000000	'@'
FD5	T0CON	0xFF	255	11111111	'\''
FD6	TMR0	0x0000	0	00000000 00000000	''
FD6	TMR0L	0x00	0	00000000	''
FD7	TMR0H	0x00	0	00000000	''
FD8	STATUS	0x00	0	00000000	''
FD9	FSR2	0x0000	0	00000000 00000000	''
FD9	FS [STATUS]	4 3 2 1 0		00000000	''
FDA	FS	N OV Z DC C		00000000	''
FDB	PL	0 0 0 0 0		00000000	''

Memory SFRs Format Individual

User program stopped

EXP\_4\_4525 (Build, Load, ...) debugger halted 18:1 INS

#### 4A. Source Code :

```
#include p18f4520.inc
    org 00
    MOVLW 99H
    MOVWF 01H
    COMF 01H
    MOVWF 66H
    COMF 66H
    MOVWF 89H
    COMF 89H
    MOVWF 97H
    COMF 97H
    MOVWF 35H
    COMF 35H
    END
```

#### 4B Source Code :

```
#include p18f4520.inc
    org 00
    MOVLW 81H
    MOVWF 20H
    MOVFF 20H, 21H
    MOVFF 20H, 22H
    MOVFF 20H, 23H
    MOVFF 20H, 24H
    COMF 24H
    END
```

## 5A. Observations :

The image displays two screenshots of the MPLAB X IDE v5.50 interface, showing the assembly code and the SFR (Special Function Register) table for a PIC18F4520 microcontroller.

**Top Screenshot:**

- Assembly Code:**

```

17 ! COMF 97H
18 0x10: COMF 0x97, F, BANKED
19 ! MOVWF 35H
20 0x12: MOVWF 0x35, ACCESS
21 ! COMF 35H
22 0x14: COMF 0x35, F, ACCESS
23

```
- SFR Table:**

Address	Name	Hex	Decimal	Binary	Char
FCA	T2CON	0x00	0	00000000	..
FCD	T1CON	0x00	0	00000000	..
FD5	T0CON	0xFF	255	11111111	..
FFC	STKPTR	0x00	0	00000000	..
FD8	STATUS	0x00	0	00000000	..
FC7	SSPSTAT	0x00	0	00000000	..
FC5	SSPCON2	0x00	0	00000000	..
FC6	SSPCON1	0x00	0	00000000	..
FC9	SSPBUF	0x00	0	00000000	..
FC8	SSPADDD	0x00	0	00000000	..
FB0	SPBRGH	0x00	0	00000000	..
FAF	SPBRG	0x00	0	00000000	..
FAB	RCSTA	0x00	0	00000000	..
FAE	RCREG	0x00	0	00000000	..
FD0	RCON	0x5C	92	01011100	..

**Bottom Screenshot:**

- Assembly Code:** (Same as the top screenshot)
- SFR Table:**

Address	Name	Hex	Decimal	Binary	Char
FE8	WREG	0x99	153	10011001	..
FD1	WREG	0	0	00000000	..
FAC	WREG	2	2	00000010	..
FAD	WREG	0	0	00000000	..
F96	WREG	10011001	7	00000111	..
F95	TRISD	0xFF	255	11111111	..
F94	TRISC	0xFF	255	11111111	..
F93	TRISB	0xFF	255	11111111	..
F92	TRISA	0xFF	255	11111111	..
FFF	TOSU	0x00	0	00000000	..
FFD	TOSL	0x00	0	00000000	..
FFE	TOSH	0x00	0	00000000	..
FFD	TOS	0x000000	0	00000000 00000000 00000000	..
	TMR3_Prescaler	0x00	0	00000000	..
	TMR3_Intensity	0x0000	0	00000000 00000000	..

## 5B. Observations :

The image displays two screenshots of the MPLAB X IDE v5.50 interface, showing the assembly source code and the SFR (Special Function Register) window.

**Top Screenshot:**

- Assembly Source:**

```

1 #include p18f4520.inc
2 org 00
3 MOVLW 81H
4 MOVWF 20H
5 MOVFF 20H, 21H
6 MOVFF 20H, 22H
7 MOVFF 20H, 23H
8 MOVFF 20H, 24H
9 COMF 24H
10 END
11

```
- SFRs Window:**

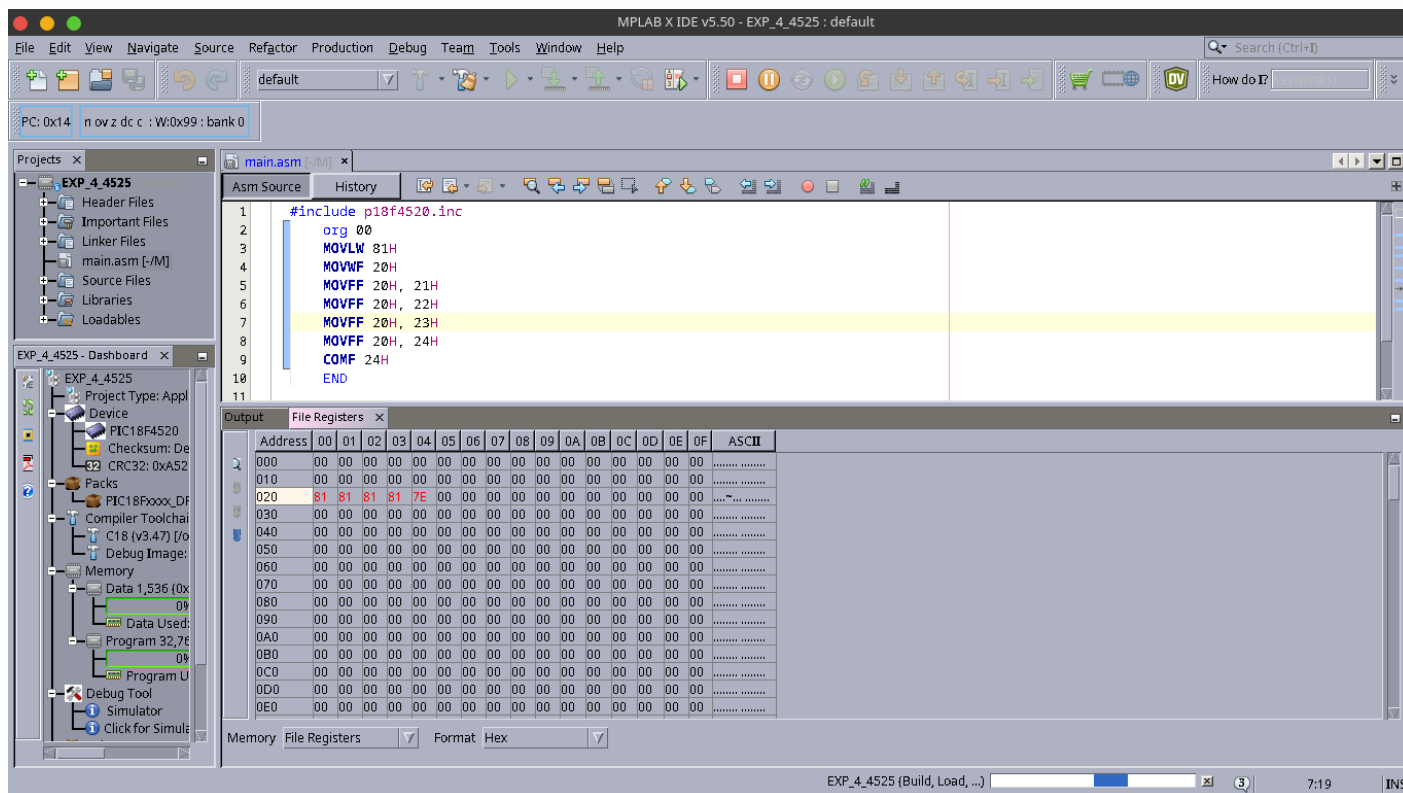
Address	Name	Hex	Decimal	Binary	Char
FE8	WREG	0x81	129	10000001	''
FD1	WD1	[WREG]	0	00000000	''
FAC	TXS	WREG	0	00000010	''
FAD	TXR	WREG	0	00000000	''
F96	TRIS	10000001	0	00000111	''
F95	TRISD	0xFF	255	11111111	'Y'
F94	TRISC	0xFF	255	11111111	'Y'
F93	TRISB	0xFF	255	11111111	'Y'
F92	TRISA	0xFF	255	11111111	'Y'
FFD	TOSU	0x00	0	00000000	''
FFD	TOSL	0x00	0	00000000	''
FFE	TOSH	0x00	0	00000000	''
FFD	TOS	0x000...	0	00000000 00000000...	''
	TMR3_Pre...	0x00	0	00000000	''
	TMR3_Int...	0x0000	0	00000000 00000000	''

**Bottom Screenshot:**

- Assembly Source:** (Same as the top screenshot)
- SFRs Window:**

Address	Name	Hex	Decimal	Binary	Char
FCA	T2CON	0x00	0	00000000	''
FCD	T1CON	0x00	0	00000000	''
FD5	T0CON	0xFF	255	11111111	'Y'
FFC	STKPTR	0x00	0	00000000	''
FD8	STATUS	0x00	0	00000000	''
FC7	SSPS	[STATUS]	4 3 2 1 0	00000000	''
FC5	SSPC	N OV Z DC C	0	00000000	''
FC6	SSPC	N OV Z DC C	0	00000000	''
FC9	SSPBI	0 0 0 0 0	0	00000000	''
FC8	SSPAD	0x00	0	00000000	''
FB0	SPBRGH	0x00	0	00000000	''
FAF	SPBRG	0x00	0	00000000	''
FAB	RCSTA	0x00	0	00000000	''
FAE	RCREG	0x00	0	00000000	''
FD0	RCON	0x5C	92	01011100	'N'





## Learning Outcomes :

- Learn the different instructions such as COMF use to complement the file register.
- Learn to check the status register.
- Learn to load the value of file register and use complement of them.

S. No.	Parameters	Marks Obtained	Maximum Marks
1.			
2.			
3.			