Experiment Number 3

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Branch ::	CSE - IoT	Sec/Grp ::	1/A
Semester ::	5th	Date ::	22nd Sept, 2021
Subject ::	Embedded System Lab	CODE ::	CSD-333

1. Aim :

To study the architecture of PIC18.

2. Task :

1. To add the contents of the UID.
2. To move the data from working register to different locations

3. Theory :

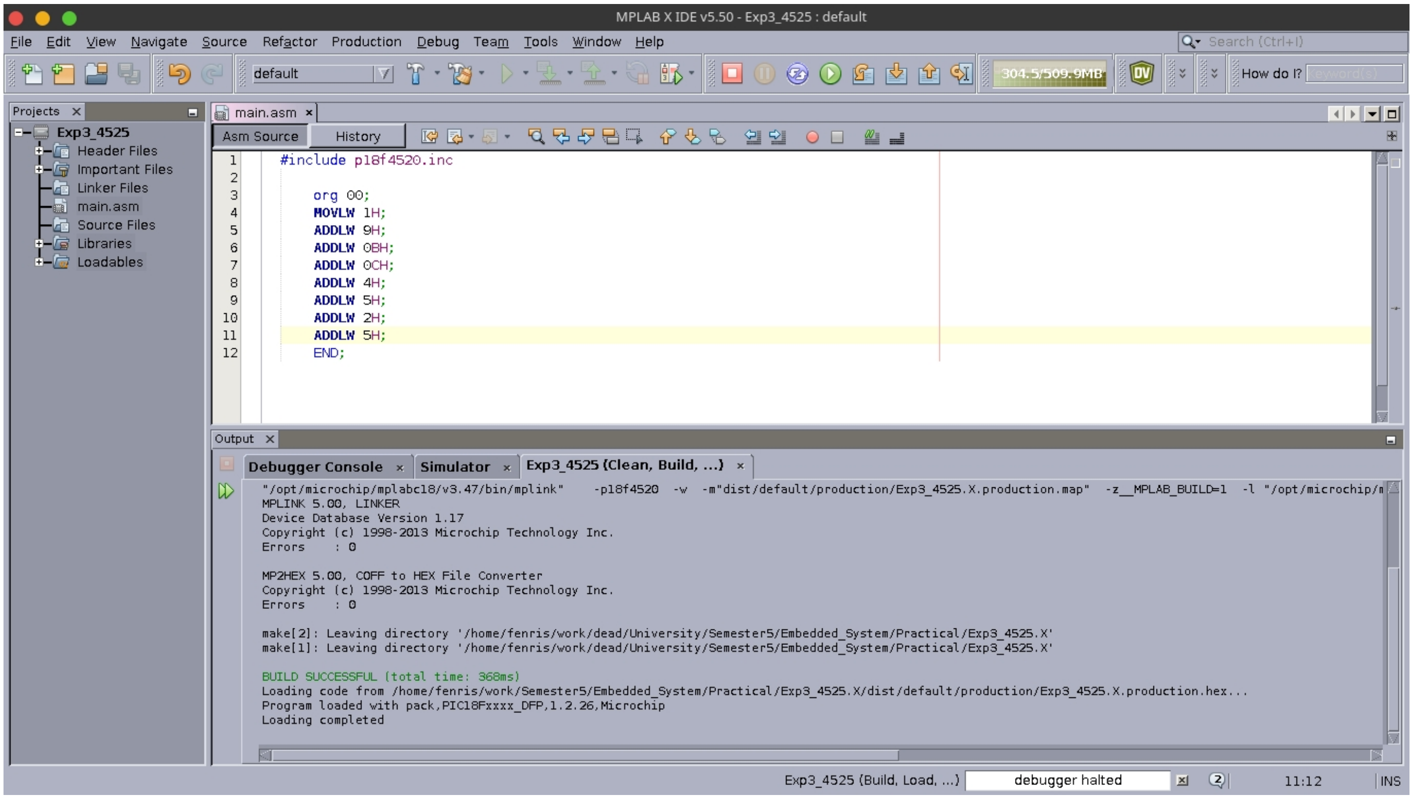
The PIC18 has a RISC (Reduced Instruction Set Computer) architecture. All PIC microcontroller is of 8 bit.

PIC18 Features:

- DataRAM: RAM space is for data storage. The PIC18 has a maximum of 4096 bytes(4k) of data RAM space. The data RAM size varies from 256 to 4096 bytes.
- DataEEPROM: Electrically Erasable Programmable Read-Only Memory of 256 bytes. It is used when there is no enough memory spaceand to reprogram the code.
- Timers: 4 timers are available.
- ADC: 10-bit Analog to Digital Convertor.
- USART: Universal Synchronous Asynchronous Receiver Transmitter is also there.
- I/OPins: The number of pins for the PIC18 package goes from 18 to 80 pins. On-chip program(code)
- ROM: The PIC18 has 2M(megabytes) of program(code) ROM.
- OTP: One-time-programmable is also a versions of the PIC18 in which you cannot reprogram it.
- UV-EPROM: The window on the UV-EPROM chip allows the UV light to erase the ROM.
- PIC18xxx with flash: The flash version of PIC because flashmemory is erased in seconds.

4A. Source Code :

```
#include p18f4520.inc

 org 00;
MOVLW 1H;
ADDLW 9H;
ADDLW 0BH;
ADDLW 0CH;
ADDLW 4H;
ADDLW 5H;
ADDLW 2H;
ADDLW 5H;
END;
```

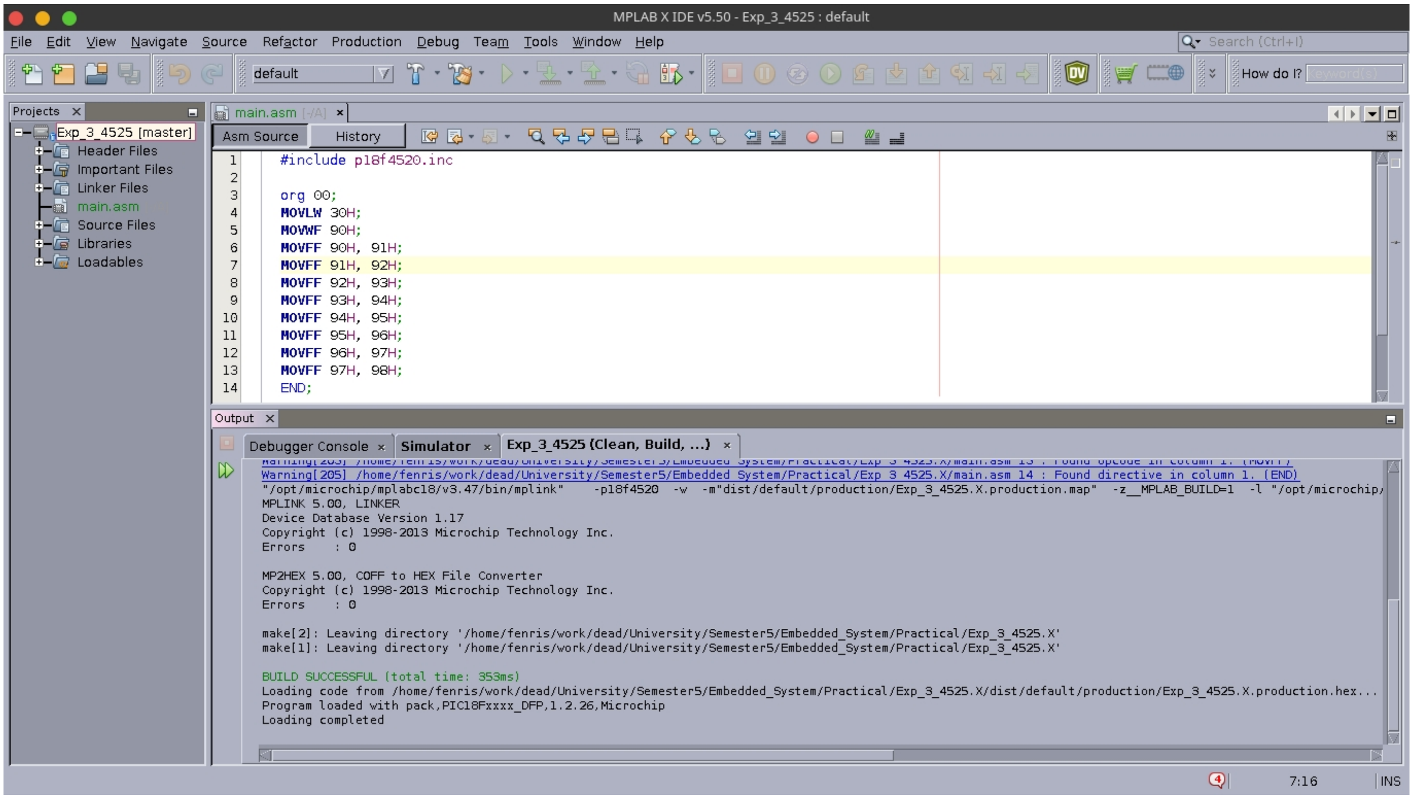


```
#include p18f4520.inc

    org 00;
    MOVLW 1H;
    ADDLW 9H;
    ADDLW 0BH;
    ADDLW 0CH;
    ADDLW 4H;
    ADDLW 5H;
    ADDLW 2H;
    ADDLW 5H;
    END;
```

```
"/opt/microchip/mplabc18/v3.47/bin/mplink"    -p18f4520  -w  -m"dist/default/production/Exp3_4525.X.production.map"  -z__MPLAB_BUILD=1  -l "/opt/microchip/m
MPLINK 5.00, LINKER
Device Database Version 1.17
Copyright (c) 1998-2013 Microchip Technology Inc.
Errors    : 0

MP2HEX 5.00, COFF to HEX File Converter
Copyright (c) 1998-2013 Microchip Technology Inc.
Errors    : 0

make[2]: Leaving directory '/home/fenris/work/dead/University/Semester5/Embedded_System/Practical/Exp3_4525.X'
make[1]: Leaving directory '/home/fenris/work/dead/University/Semester5/Embedded_System/Practical/Exp3_4525.X'

BUILD SUCCESSFUL (total time: 368ms)
Loading code from /home/fenris/work/Semester5/Embedded_System/Practical/Exp3_4525.X/dist/default/production/Exp3_4525.X.production.hex...
Program loaded with pack,PIC18Fxxxx_DFP,1.2.26,Microchip
Loading completed
```

4B. Source Code :

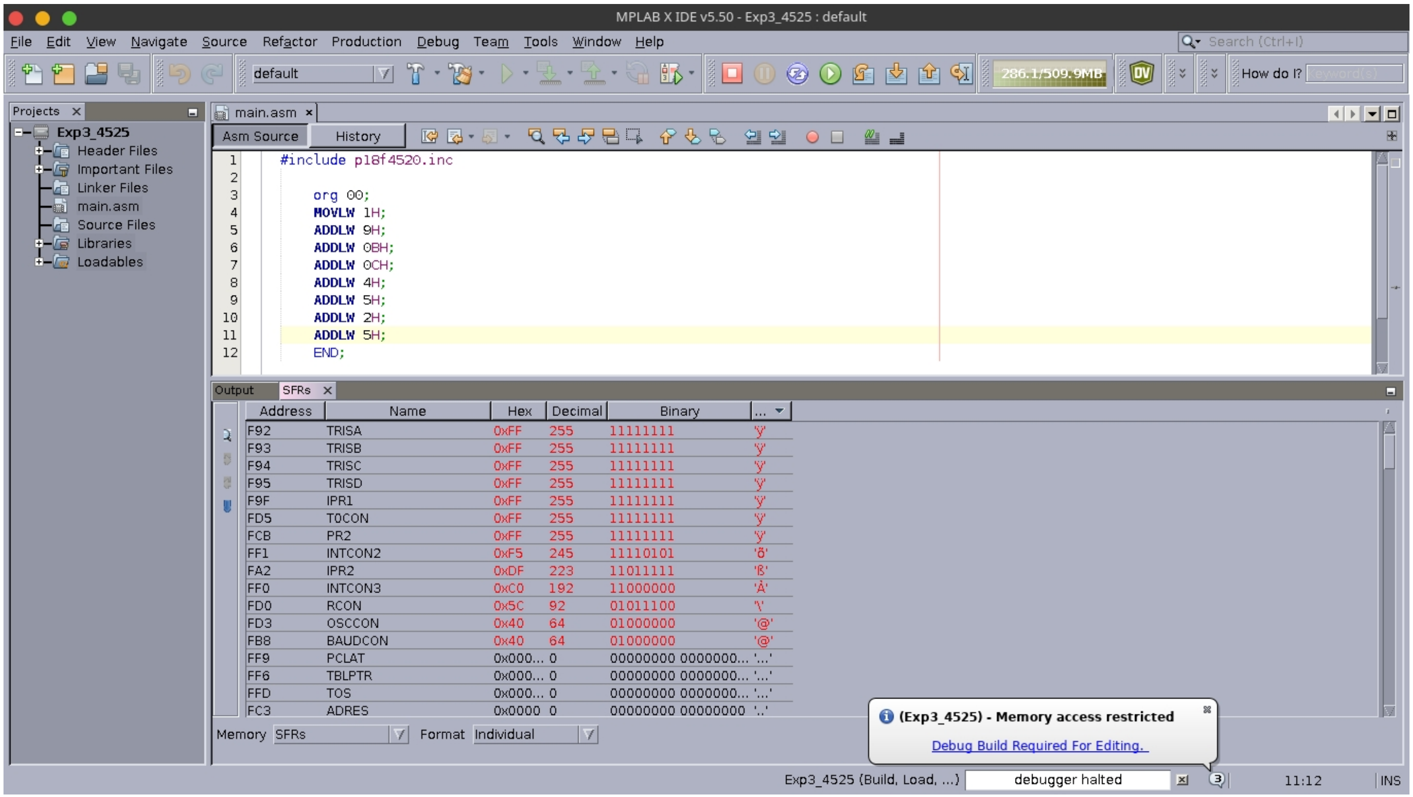
```
include p18f4520.inc

org 00;
MOVLW 30H;
MOVWF 90H;
MOVFF 90H, 91H;
MOVFF 91H, 92H;
MOVFF 92H, 93H;
MOVFF 93H, 94H;
MOVFF 94H, 95H;
MOVFF 95H, 96H;
MOVFF 96H, 97H;
MOVFF 97H, 98H;
END;
```



```
#include p18f4520.inc

org 00;
MOVLW 30H;
MOVWF 90H;
MOVFF 90H, 91H;
MOVFF 91H, 92H;
MOVFF 92H, 93H;
MOVFF 93H, 94H;
MOVFF 94H, 95H;
MOVFF 95H, 96H;
MOVFF 96H, 97H;
MOVFF 97H, 98H;
END;
```

```
Warning[203] /home/fenris/work/dead/University/Semester5/Embedded System/Practical/Exp 3 4525.X/main.asm 13 : Found opcode in column 1. (MOVFF)
Warning[205] /home/fenris/work/dead/University/Semester5/Embedded System/Practical/Exp 3 4525.X/main.asm 14 : Found directive in column 1. (END)
"/opt/microchip/mplabc18/v3.47/bin/mplink"    -p18f4520  -w  -m"dist/default/production/Exp_3_4525.X.production.map"  -z__MPLAB_BUILD=1  -l "/opt/microchip/
MPLINK 5.00, LINKER
Device Database Version 1.17
Copyright (c) 1998-2013 Microchip Technology Inc.
Errors    : 0

MP2HEX 5.00, COFF to HEX File Converter
Copyright (c) 1998-2013 Microchip Technology Inc.
Errors    : 0

make[2]: Leaving directory '/home/fenris/work/dead/University/Semester5/Embedded_System/Practical/Exp_3_4525.X'
make[1]: Leaving directory '/home/fenris/work/dead/University/Semester5/Embedded_System/Practical/Exp_3_4525.X'

BUILD SUCCESSFUL (total time: 353ms)
Loading code from /home/fenris/work/dead/University/Semester5/Embedded_System/Practical/Exp_3_4525.X/dist/default/production/Exp_3_4525.X.production.hex...
Program loaded with pack,PIC18Fxxxx_DFP,1.2.26,Microchip
Loading completed
```

5. Observations :



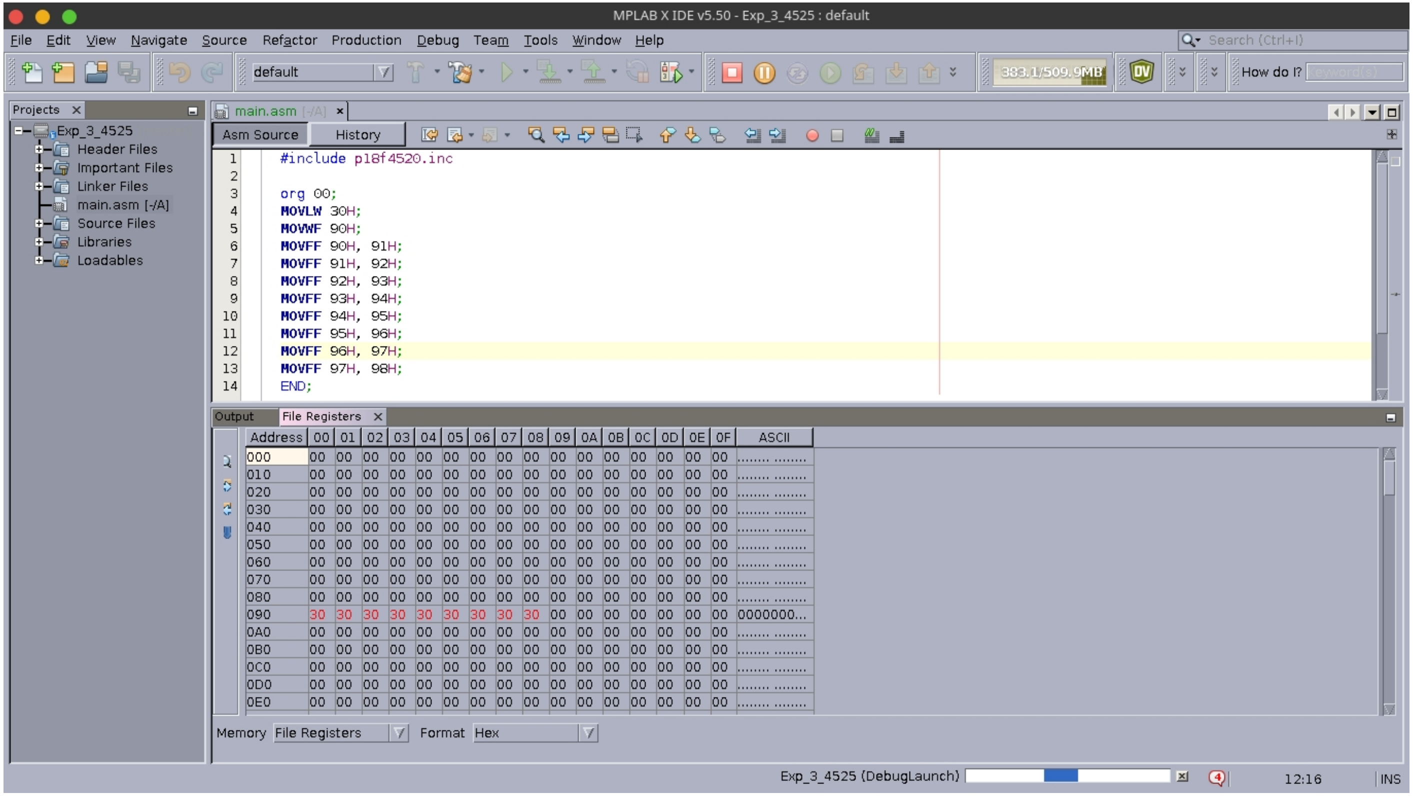
```
#include p18f4520.inc

    org 00;
    MOVLW 1H;
    ADDLW 9H;
    ADDLW 0BH;
    ADDLW 0CH;
    ADDLW 4H;
    ADDLW 5H;
    ADDLW 2H;
    ADDLW 5H;
    END;
```

Address	Name	Hex	Decimal	Binary	...
F92	TRISA	0xFF	255	11111111	'ÿ'
F93	TRISB	0xFF	255	11111111	'ÿ'
F94	TRISC	0xFF	255	11111111	'ÿ'
F95	TRISD	0xFF	255	11111111	'ÿ'
F9F	IPR1	0xFF	255	11111111	'ÿ'
FD5	T0CON	0xFF	255	11111111	'ÿ'
FCB	PR2	0xFF	255	11111111	'ÿ'
FF1	INTCON2	0xF5	245	11110101	'õ'
FA2	IPR2	0xDF	223	11011111	'ß'
FF0	INTCON3	0xC0	192	11000000	'À'
FD0	RCON	0x5C	92	01011100	'\'
FD3	OSCCON	0x40	64	01000000	'@'
FB8	BAUDCON	0x40	64	01000000	'@'
FF9	PCLAT	0x000...	0	00000000 0000000...	'...'
FF6	TBLPTR	0x000...	0	00000000 0000000...	'...'
FFD	TOS	0x000...	0	00000000 0000000...	'...'
FC3	ADRES	0x0000	0	00000000 00000000	'..'

Memory SFRs Format Individual

(Exp3_4525) - Memory access restricted
Debug Build Required For Editing.

Exp3_4525 (Build, Load, ...) debugger halted 11:12 INS



```
#include p18f4520.inc

org 00;
MOVLW 30H;
MOVWF 90H;
MOVFF 90H, 91H;
MOVFF 91H, 92H;
MOVFF 92H, 93H;
MOVFF 93H, 94H;
MOVFF 94H, 95H;
MOVFF 95H, 96H;
MOVFF 96H, 97H;
MOVFF 97H, 98H;
END;
```

Address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	ASCII
000	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....
010	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....
020	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....
030	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....
040	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....
050	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....
060	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....
070	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....
080	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....
090	30	30	30	30	30	30	30	30	30	00	00	00	00	00	00	00	0000000...
0A0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....
0B0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....
0C0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....
0D0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....
0E0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....

Memory File Registers Format Hex

Exp_3_4525 (DebugLaunch) 12:16 INS

Learning Outcomes :

- Learnt the concept of hexadecimal location.
- Learn to write data in working registers and then moving to the desired location.
- Gain the information on how to see file registers, SFRs, Program Memory etc.
- Learnt about the internal architecture of PIC.

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