EEE 316

Microprocessor and Interfacing Sessional

Experiment 3

Name of the experiment: Rotate, Shift and LOOPs in assembly language

Venue: Interfacing Lab

Department of Electrical and Electronic Engineering, BUET

EEE 316 Experiment 3
Department of Electrical and Electronic Engineering, BUET.

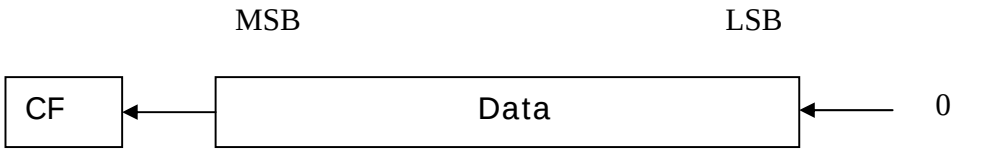
Objective:

To get familiar with Rotate and Shift commands in assembly langiage.
To use loops in complex problems.

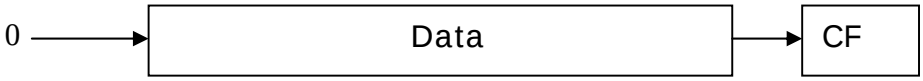
Introduction:

Shift and Rotate command:

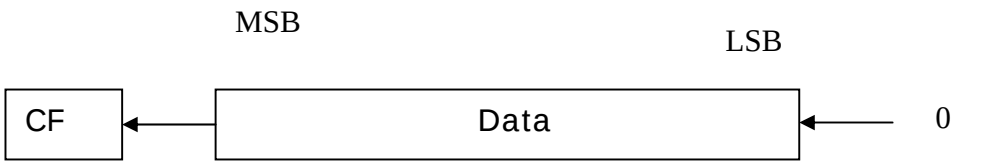
Shift and Rotate commands are used to convert a number to another form where some bits are shifted or rotated. Basic difference between shift and rotate is shift command makes “fall of” bits at the end of register. Where rotate command makes “Wrap around” at the end of the register. There are both arithmatic (SAL and SAR) and logical (SHL and SHR) shift instructions. Graphical operation for these commands are shown below.



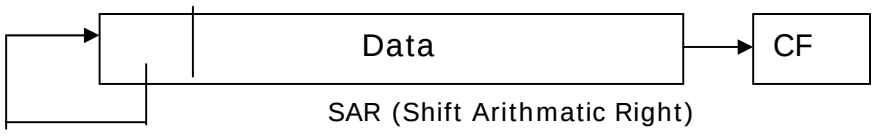
SHL (Shift Logical Left)



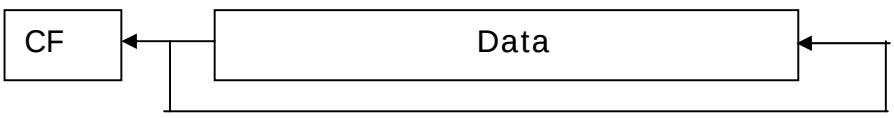
SHR (Shift Logical Right)



SAL (Shift Arithmatic Left)

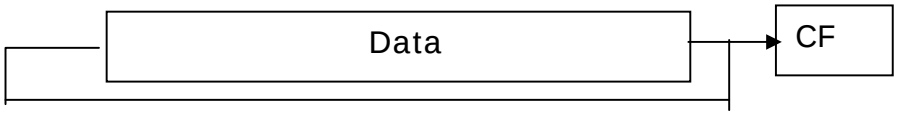


SAR (Shift Arithmatic Right)

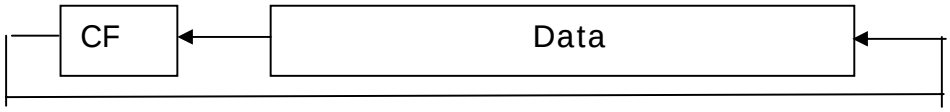


EEE 316 Experiment 3
Department of Electrical and Electronic Engineering, BUET.

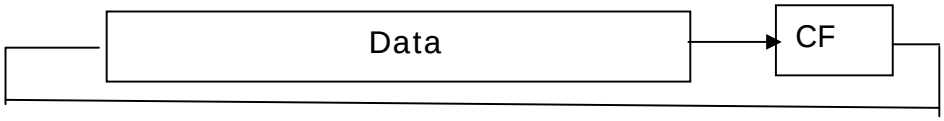
ROL (Rotate Left)



ROR (Rotate Right)



RCL (Rotate Through Carry Left)



RCR (Rotate Through Carry Right)

Some simple codes can be given to clarify the idea.

```
MOV CL,03H        ;
MOV AX,02F3H      ; In binary 0000 0010 1111 0011
SHR AX,CL         ; In binary 0000 0000 0101 1110
```

In this procedure, SHR commands inserts 0's from right side. Each time a 0 is inserted left most bit is vanished from register content.

```
MOV CL,03H        ;
MOV AX,82F3H      ; In binary 1000 0010 1111 0011
SAR AX,CL         ; In binary 1111 0000 0101 1110
```

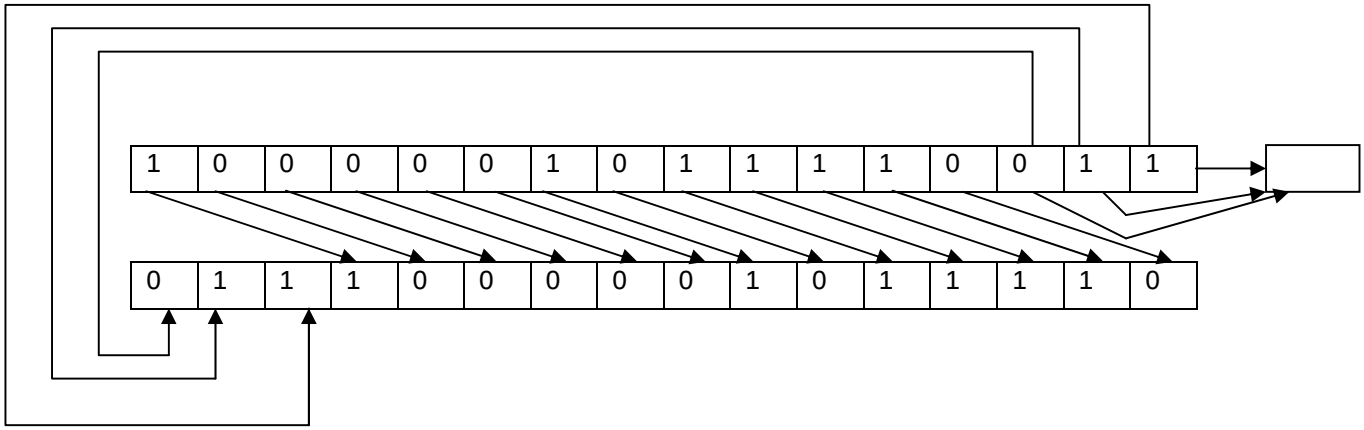
In this procedure, SHR commands inserts MSB content from right side. Each time it is inserted left most bit is vanished from register content.

```
MOV CL,03H        ;
MOV AX,82F3H      ; In binary 1000 0010 1111 0011
ROR AX,CL         ; In binary 0111 0000 0101 1110
```

The whole procedure can be visualized as follows.

Mr. Md. Itrat Bin Shams, EEE, BUET, June, 2007.

EEE 316 Experiment 3
Department of Electrical and Electronic Engineering, BUET.



Here rotate by 3 operation is shown. It is clearly seen that every bit is assigned to a new position that is 3 places away from previous one. Unlike the shift command no right bit is destroyed. It is placed in the leftmost position.

Exercise part 1:

(a) Program 1:

```
CODE  SEGMENT
      ASSUME CS:CODE

      MOV CL,02H
      MOV AX,105AH
      SHL  AX,CL
      HLT

CODE  ENDS
      END
```

Obtain AX register value in write the previous value and present value in binary form. What type of operation is this?_____

_____

(b) Program 2:

```
CODE  SEGMENT
      ASSUME CS:CODE

      MOV CL,04H
      MOV AX,564AH
      SAL AX,CL
      HLT

CODE  ENDS
      END
```

Mr. Md. Itrat Bin Shams, EEE, BUET, June, 2007.

Obtain AX register value in write the previous value and present value in binary form. What type of operation is this?_____

_____

(c) Perform for similar values of AX and CL with ROL, ROR. RCL, RCR command.

LOOP in assembly language:

Loop commands are used to perform same operation again and again. This is like for, while type instructions in 'C' or 'MATLAB'. A common example can be shown as,

```
      MOV  CX,0100D
      MOV  AX,564AH
Lev:  DEC  AX
      Loop LEV
      HLT
```

Here CX acts as a count register. Loop Lev instruction leads instruction to go back to Lev level until CX is zero. Each time Lev level is executed CX is decreased by 1. Loop command can be used for waiting purposes. Such as,

```
      MOV  CX,0100D
Wt:   NOP
      Loop Wt
      HLT
```

Here the loop is executed until CX is zero. If 1 loop takes 1ms, the program will wait for 100ms.

Exercise part 2:

(a) Program 1:

```
CODE  SEGMENT
      ASSUME CS:CODE

      MOV AX,1025H
      MOV BX,475AH
      MOV CX,50H
Lev:  INC AX
      DEC BX
      LOOP Lev
      HLT

CODE  ENDS
      END
```

Observe the operation of this code. What happens when the loop is executed again and again.

(b) Program 2: This code is to find GCD of two numbers.

```
CODE  SEGMENT
      ASSUME CS:CODE

      MOV  AX,5H
      MOV  BX,3H
 Lev: XOR DX,DX
      DIV  BX
      MOV  AX,BX
      MOV  BX,DX
      TEST DX,0H
      JNZ  Lev
      HLT
CODE  ENDS
      END
```

Here GCD of 5 and 3 are found. You can change the values of AX and BX and obtain the result for any other values. Find GCD of 08D4H and 235H.
Result:_____

(c) Find Least Common Multiplier of 12H and 25H.

Report:

1. Suppose x = 20 and y = 28. Add y with x for 30 times.
2. Multiply 12 by 6 until result is below 3000H. If result is greater than this, divide the result by 2 for 3 times.
3. You can get input into microprocessor via following code.

   ```
   MOV AH, 1H ; keyboard input subprogram
   INT 21H
   HLT
   ```

   Take input from the keyboard until b is pressed.