4- Shift and Rotate Instruction

*shift instruction move a data stored within a register of memory location to the left or right .

* there are two basic types of shifts , these are :-

1_ logical shift (SHR , SHL)

2_ Arithmetic shift (SAR , SAL)

*logical shift instructions works with unsigned numbers while arithmetic shift instructions works with signed numbers.

SHR and SHL Instructions

These two instructions work as follows

*the basic format of these two instruction are :-

SHR D , count . SHL D ,count

*the destination operand (D) can be a register or a memory location as we said previously . while the (count) source operand can be specified by :-

1_ count = immediate data count = 1 , 5 , 12 , …

2_ count of register count = cl

SHR AX , 3 ; shift right the content of AX by 3 bit .

SHL AX , CL ; shift left AX by CL number of bits .

SAR and SAL Instruction

These two instruction works signed numbers , and as illustrated below :-

C <---- S ←--- 0 S -----→ --→ C

***it format is similar to the logical shifts as follows :-**

SAR D , count ; SAL D , count

EX:/ assume that the initial contents of AX is 091AH determine the new value of AX contents and the carry flag after executing the following instructions

Mov cl , 02

SAR AX , CL

NOTE:

Shifting numbers to the right 1_bit causes a division by 2 , while.

Shifting to the left 1_bit causes a multiplication by 2 .

Therefore shifting a number n-places to the right/left result a division/multiplication by 2^n of the shifted number .

EX / write an assembly language program to perform the following using shift instructions (DX) = 5(AX)

Rotate instruction (ROL , ROR , RCL ,RCR)

***rotate instructions position binary data by rotating the instruction through a register or a memory content either from one end to another (ROL , ROR) or throughout the carry flag (RCL , RCR)**

***rotate instructions also have two operands , the destination operand which can be any general purpose register , and the count source operand also the rotate count can be immediate or located in register CL**

EX / write assembly language program that will shift a 32_bit number stored at BX-AX registers one position to the left .

H.W / write an assembly language program that will fill the content of BL register with the value of bit 3 of AL register .