Assignment 4

Due date: 20-11-2023

Spondon Sayeed

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**Which instruction shifts each bit in an operand to the left and copies the highest bit into both the Carry flag and the lowest bit position?**

ROL

**Which instruction shifts each bit to the right, copies the lowest bit into the Carry flag, and copies the Carry flag into the highest bit position?**

RCR

**Write a sequence of shift instructions that cause AX to be sign-extended into EAX.**

First, shift EAX 16 bits to the left. Next, shift it arithmetically 16 bits to the right:

shl eax,16

sar eax,16

**Suppose the instruction set contained no rotate instructions. Show how we might use SHR and a conditional jump instruction to rotate the contents of the AL register one position to the right.**

shr al,1 ; shift AL into Carry flag

jnc next ; is the Carry flag set?

or al,80h ; yes: set highest bit

; no: do nothing ;

next:

**What happens to the Carry flag when the SHR AX,1 instruction is executed?**

The Carry flag receives the lowest bit of AX (before the shift).

**Write a logical shift instruction that multiplies the contents of EAX by 16.**

shl eax,4

**Write a logical shift instruction that divides EBX by 4.** shr ebx, 2

**Write a single rotate instruction that exchanges the high and low halves of the DL register**

ror dl,4 (or: rol dl,4)

**Show the value of AL after each shift or rotate instruction has executed in the provided code sequence.**

**a. mov al, 0D4h**

**shr al, 1** ;a = 6Ah

**; b. mov al, 0D4h**

**sar al, 1** ;b = EAh

**; c. mov al, 0D4h**

**sar al, 4** ;c = FDh

**; d. mov al, 0D4h**

**rol al, 1** ;d = A9h

**Show the value of AL after each shift or rotate instruction has executed in another code sequence.**

**; a. mov al, 0D4h**

**ror al, 3** ;a = 9Ah

**; b. mov al, 0D4h**

**rol al, 7** ;b = 6Ah

**; c. stc mov al, 0D4h**

**rcl al, 1** ;c = 0A9h

**; d. stc mov al, 0D4h**

**rcr al, 3** ;d = 3Ah