EEEN311 Logic Circuits and Micropr., Midterm

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Date:
Duration: 60 mins
Name Surname: Solution Manual 100/100

YOU HAVE TO SHOW THE OPERATIONS TO GET FULL SCORE!

1. Suppose we are working on a machine with 9-bit 2-s complement integers (20pts).

   a. What are the largest possible and smallest possible numbers that can be expressed? (10pts)

Largest => 0 1111 1111 => $2^8-1 = 255$

Smallest => 1 0000 0000 => -256

   b. Perform $(011010100)_2 - (011101011)_2$ using 2's complement method and convert the result to decimal. (10pts)

011010100 - 011101011

011010100 + 100010101 = 111101001=> Since MSB is negative, this is a negative number. CPU stores this binary number, but of course, you have to convert to decimal for getting full points! So, apply 2's comp. again since MSB is 1, 111101001=> 000010111 = -23

2. Solve the following questions. (20 pts)
   a. If DS=7A2FH and the offset is 384EH find:
      1. Logical address

7A2FH:384EH

      2. Physical address

7A2F0H+0384EH=
0+E=E
F+4=19=>3 with a carry
1+2+8=B
A+3=D
0+7=7
➔7DB3E

      3. Lower range of the data segment

7A2F0H

4. Upper range of the data segment

```
7A2F0H+0FFFFH=
0+F=F
F+F=30=>E with a carry
1+2+F=18=>2 with a carry
1+A+F=36=>A with a carry
1+7+0=8
➔8A2EFH
```

3. Find the final status of the CF, PF, AF, ZF and SF after the following operation: (20pts)

```
mov bl, 8EH
add bl, 72H
mov cl, ffh
inc cl
```

```
1111 1111 + 0000 0001 = 0000 0000 with a carry beyond d7

CF=1 PF=1 AF=1 ZF=1 SF=0

You can easily test this and see the result in the
emulator.
```

4. Write an assembly program that computes the five times of the value inside 0050H:0200H; and, stores it inside 0110H:0811H (You cannot use mul instruction!) (40pts)

Brute force solution without a loop:

```
org 100h
mov ax,0050H
mov ds,ax

mov [0200H], 03H ; the number stored can be different if you want.

mov ax, [0200H]

;looks unprofessional but this is an acceptable solution for this
particular question since the number of iterations is just 5 :)
add ax, [0200H]
add ax, [0200H]
add ax, [0200H]
add ax, [0200H] ; Be aware just 4 add instructions!

mov bx,0110H
mov ds,bx
mov [0811H],ax
ret
```

An example loop solution: Not necessary since it is just 5 iterations, but anyhow:

```
org 100h
mov ax,0050H
mov ds,ax

mov [0200H], 03H ; the number stored can be different if you want.

mov ax, [0200H]
mov cx,4

add_lbl: add ax, [0200H]
dec cx
jnz add_lbl

mov bx,0110H
mov ds,bx
mov [0811H],ax
ret
```

Good luck!