



Student Name: ..... ID: ..... Grade: .....

**(Q1) Write true or false for the following statements [10 Points]:**

1. [ T ] The PUSHAD instruction pushes all the 32-bit general-purpose registers on the stack.
2. [ T ] The MOVSX instruction fills the upper half of the destination with a copy of the source operand's sign bit.
3. [ F ] When the MUL BX instruction executes, the 32-bit product ends up in the EAX register.
4. [ T ] An assembler is a program that converts source-code programs written in assembly language into object files in machine language.
5. [ F ] The MUL instruction sets the Overflow flag if the upper half of the product is equal to zero.
6. [ F ] A Debugger is a program that combines your program's object file created by the assembler with other object files and link libraries.
7. [ F ] The SAR and SHR instructions perform the same operation.
8. [ F ] The .386 directive identifies the maximum CPU required for the program (Intel386).
9. [ F ] In the "mov" instruction one operand must be a register.
10. [ T ] The XCHG (exchange data) instruction exchanges the contents of two operands.

**(Q2) Choose the correct answer: [10 Points]:**

1. Which of the following instructions will divide the unsigned integer in EBX by 8?

a. shr ebx,8	b. shr ebx,3
c. sar ebx,8	d. shl ebx,3

2. What will be the hexadecimal values of DX and AX after the following instructions have executed?

```

mov ax, 6B49h
mov dx, 4095h
shl ax, 1
rol dx, 1

```

a. DX = 0148h, AX = C691h	b. DX = 012Ah, AX = C9A2h
c. DX = 812Ah, AX = D692h	d. DX = 024Bh, AX = D692h

### Example 1

```

1: .data
2: str1 BYTE "AAAX", 0
3: str2 BYTE 10 DUP(0FFh)
4: .code
5:     mov edi, 0
6: L1: mov al, [str1+edi]
7:     cmp al, 0
8:     je  L2
9:     mov [str2+edi], al
10:    inc edi
11:    jmp L1
12:    L2:

```

3. After Example 1 executes, what value will be stored at offset [str2+4]?

a. 0FFh	b. ASCII code of "X"
c. 00h	d. cannot be determined

4. In Example 1, if we changed lines 7, 8, and 9 to the following, what value would be stored at offset [str2+4] after the loop finished?

```

7:  mov [str2+edi], al
8:  cmp al, 0
9:  je  L2

```

a. 0FFh	b. ASCII code of "X"
c. 00h	d. cannot be determined

5. The content of AH register after the following operation is:

```

mov ax, 95h
mov bl, 10h
div bl

```

a. 09h	b. 05h
c. 00h	d. none

**(Q3) [18 Points]**

- A. **[10 Points]** Assume that you are given an array that ends with '#'. Write a program that counts the number of digits [0 - 9], and the number of the small characters [a-z] contained in the array.

**Solution:**

```
.model small
.386
.stack 100h
.data
array db 3,'a','b','c','$','A',5,'#'
.code
main:
    mov ax,@data
    mov ds,ax

    mov esi,offset array
    mov bl,0    ;number of digits.
    mov dl,0    ;number of chars

L:  mov al,[esi]
    cmp al,'#'
    je exit
    cmp al,0
    jb not_match
    cmp al,9
    jbe L_Digit

    cmp al,'a'
    jb not_match
    cmp al,'z'
    jbe Char

not_match:
    inc esi
    jmp L
L_Digit:
    inc bl
    inc esi
    jmp L

Char:
    inc dl
    inc esi
    jmp L

exit:
    mov ah,4ch
    int 21h

end main
```

- B. [8 Points]** Write an assembly language program to find the location of the first non-negative value in an array:

```
arr dw -2,-4,-77,5566h,7788h
val dw ?
```

Hint: use **BT** instruction.

**Solution:**

```
.model small
.386
.stack 100h
.data
arr dw -2,-4,-77,5566h,7788h
val dw ?
.code
main:
mov ax,@data
mov ds,ax

mov bx,0
mov cx,5
LL:
    mov ax,[arr+bx]
    bt ax,15
    jnc found
    add bx,2
    loop LL
    jmp fin
found:
    mov val,bx
fin:
    mov ah,4ch
    int 21h
end main
```

**Bonus Question [2 Points]**

What is your best characteristics?

**MADRIDI** ☺