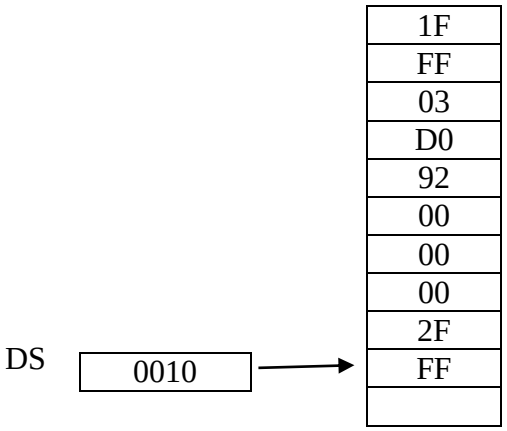
ECE3210 Microprocessor Engineering - Practice Exam1

Name: _____

1. (20 pts) **Protected mode memory accessing**

Assume the 80386 is running in protected mode with the state given below.
DS = 0010 H
ESI = 00001202
EBP = 0000FC4

Global Descriptor Table



a. What physical address does the following instruction access?

MOV AX, [ESI]

Solution:
Based on the descriptor, DS segment base is: 03000000H, limit is 02FFFFFFH
So the physical address being accessed is: Base + ESI = 03000000H + 00001202H =03001202H

b. Is memory physical address 06500000H within this segment?
Solution:

Based on the descriptor, DS segment base is: 03000000H, limit is 02FFFFFFH, so memory address 06500000H is not in this segment

2. (40 points) **Data transfer and memory addressing**

For each data transfer instruction, list all register final contents, or memory physical address and contents that are modified. Assume real mode operation. Consider each instruction separately.

Register initial state:

AX: 0000H BX: 0008H CX: 021EH DX: FF00H
SI: 0002H DI: 00101H DS: 1201H

Memory Address

12000H	20	13	80	40
12004H	FF	AF	BC	13
12008H	99	88	77	66
1200CH	A8	B1	F0	43
12010H	78	D6	32	33
12014H	23	35	12	26
12018H	83	03	8C	EF

a. MOV AX, [BX+01H]

Solution:
Source memory physical address = 12010+0008+01=12019H
Destination register AX content: word at 12019H = 8C03H

AX____8C03H _____

b. MOV WORD PTR [DI], -6

Solution:
Source Immediate = -6 = FFFA H (2's complement)
Destination memory physical address = 12010+00101=12111H
Data size is WORD
Location: 12111H contains FAH
Location 12112H contains FFH

Memory physical addresses _12111H ____12112H_____
Memory contents ___FAH _____FFH_____

c. MOV DI, OFFSET [SI + 0A2BH]

Solution:
Source offset address = 0002 +0A2B =0A2DH
Destination register DI content: 0A2DH

DI ___0A2DH_____

d. MOV AL, [BX+SI]

Solution:
Source memory address: DS: [BX+SI] = 12010+0008+0002 = 1201AH
Destination AL content: 8C H

AL____8CH _____

3. (20 points) Write a program which swaps the contents of two memory variable x and y

```
.data
x     dw    1234h
y     dw    5678h

.code

mov ax, x
mov bx, y
mov x, bx
mov y, ax


;or
push x
push y
pop x
pop y
```

4. (20 points)

Assume SP =0100H. What will be the content of SP, AX, and EBX after executing the following two instructions?

POP AX
POP EBX

Stack segment is shown below:

Offset Address SP	Value
0108H	99
0107H	12
0106H	45
0105H	3B
0104H	42
0103H	32
0102H	8C
0101H	5B
0100H	FF
00FFH	AC
00FEH	85
00FDH	2D
00FCH	78
00FBH	5B
00FAH	9F
00F9H	1A

Solution:

SP =106 H

AX = 5BFF H

EBX = 3B42328C H