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Question 1(4): Memory Contents:

Addr ess	140 05h	140 04h	140 03h	140 02h	140 01h	140 00h	13F FEh	13F FDh	120 06h	120 05h	120 04h	120 03h
Data	80h	7Fh	FFh	01h	88h	1Ch	00h	50h	34h	12h	A5h	F0h

DS = 1200h, CS = 0A00h, SS = 8500h, ES = 1300h AX = 0000h, BX = 4000h, CX = 0002h, DX = FFFFh SI = 1000h, DI = 0003h, BP = 0FFDh

MOV AX, [DI+SI+1000h]

ADD AX, 0C01h

- a. What are the 5th smallest and 8th largest segment:offset pairs for the physical address accessed by MOV? [2.5]

$$\begin{aligned}\text{physical address} &= DS \times 10 + (1000 + 3 + 1000) \\ &= 12000 + 2003h = \mathbf{14003h}\end{aligned}$$

Largest logical address =>

1st => 14000 => 1400:0003

2nd => 13FF:0013

3rd => 13FE:0023

4th => 13FD:0033

5th => 13FC:0043

6th => 13FB:0053

7th => 13FA:0063

8th => 13F9:0073

Smallest logical address =>

1st => 14003 - FFFF => 04004 => 04010 => 0401:FFF3

2nd => 0402:FFE3

3rd => 0403:FFD3

4th => 0404:FFC3

5th => 0405:FFB3

PA=>14003

04050-> 0405:FFB3

04040->
04030->
04020->
04010+FFF3 ->0401:FFF

b. Which flags are set after ADD? (AF, SF, CF, OF, PF) [1.5]

14003h => Data =>7FFFh (as we need 16 bit data to store in AX)

7FFF+0C01=

0111 1111 1111 1111
 0000 1100 0000 0001

1000 1100 0000 0000-> **AF=1 SF=1 CF=0 OF=1 PF=1**

Physical Address	15A00h	15A01h	18450h	18451h	1C234h	1C235h
Data	34h	12h	50h	03h	A0h	25h

Question 2(4): CS = 2000h DS = 1500h SS = 8000h BX = ????h SI = 0450h BP = 03DEh. **Instruction 1:** JMP [BX+SI] is executed. After this JMP, the CPU fetches the next instruction from physical address 20350h. **Instruction 2:** At the new location, JMP SS:[BP] is executed. After this second JMP, the CPU fetches from physical address 203DEh.

a. From Ins 1, physical address accessed was 18450h, find the value of BX given that SI = 0450h. [2]

$$PA = DS \times 10 + (BX + SI)$$

$$18450 = 15000 + BX + 0450$$

$$BX = 18450 - 15450 = 3000h$$

b. After both JMPs execute, how much did the IP change in total from its original position (before first JMP) to its final position (after second JMP)? If the original IP was 0150h, what's the net change? [2]

Even though CS remains 2000h for both cases, the IP values are different: Physical Address = CS × 10h + IP

After first JMP: Physical = 20000h + 0350h = 20350h IP= 0350h

After second JMP: Physical = 20000h + 03DEh = 203DEh IP= 03DEh

the difference in IP values: **03DEh - 0350h = 008Eh**

Question 3(3): Identify the addressing mode

- (a) MOV SI, [SI] (register indirect) (b) MOV [BX+SI+80h], DI (base relative plus index) (c) IN 05h, AL (invalid)

Question 4 (3) : Machine code to instruction:

- a. 8B07 **MOV AX, [BX]**
- b. 898C7618 **MOV [SI+1876h], CX**
- c. 89FF **MOV DI, DI**

RM	MOD				
	00	01	10	11	W = 0 W = 1
000	[BX] + [SI]	[BX] + [SI] + d8	[BX] + [SI] + d16		AL AX
001	[BX] + [DI]	[BX] + [DI] + d8	[BX] + [DI] + d16		CL CX
010	[BP] + [SI]	[BP] + [SI] + d8	[BP] + [SI] + d16		DL DX
011	[BP] + [DI]	[BP] + [DI] + d8	[BP] + [DI] + d16		BL BX
100	[SI]	[SI] + d8	[SI] + d16		AH SP
101	[DI]	[DI] + d8	[DI] + d16		CH BP
110	d16 (direct address)	[BP] + d8	[BP] + d16		DH SI
111	[BX]	[BX] + d8	[BX] + d16		BH DI