

# ASSEMBLY MID EXAM

FALL-2013



Question #1 (5 Points): Study the following program and determine the contents of the registers listed in the table below after executing the following program:

```

.Model Tiny
.code
.startup
    MOV AX, 1000H
    MOV ES, AX
    MOV BX, 5100H
    MOV AX, 6543H
    MOV DX, 7200H
    MOV CX, 8008H
    MOV DI, 0CDEFH
    MOV SI, 0ABCDH
    MOV SP, 4100H
    MOV BP, 9FC4H

    PUSH DI
    PUSH SI
    PUSH SP
    POP DI
    PUSH CX
    PUSH AX
    MOV BP, SP
    MOV DX, [BP+3]
    POP SI
    POP CX

    PUSH WORD PTR 1200h
    PUSH BX
    POP AX
    POP BP
    POP BX

.exit
END
    
```

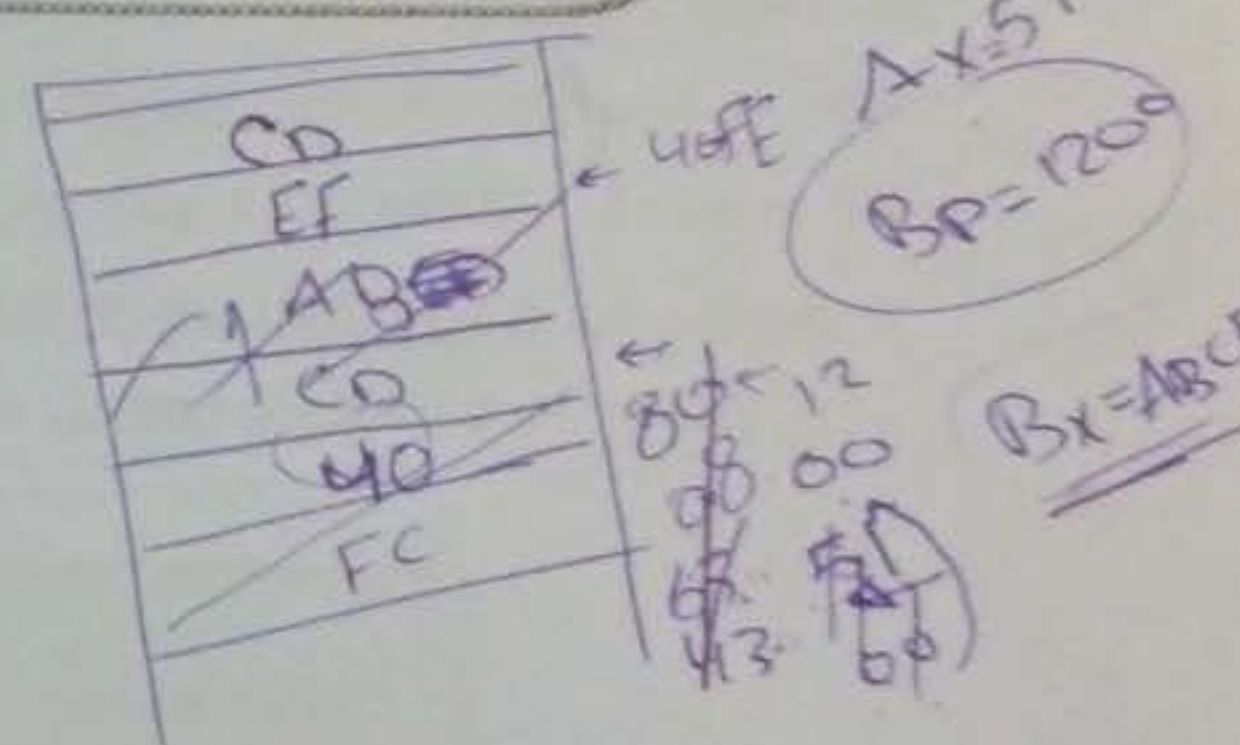
~~AX = 1000H~~  
 ES = 1000H  
 BX = 5100H  
 AX = 6543H  
 DX = 7200H  
 CX = 8008H

DI = 0CDEFH  
 SI = ABCDH  
 SP = 4100H  
 BP = 9FC4H

Answer

DI =	40FC H
BP =	1200 H
SI =	6543 H
DX =	CD80 H
SP =	40FE H

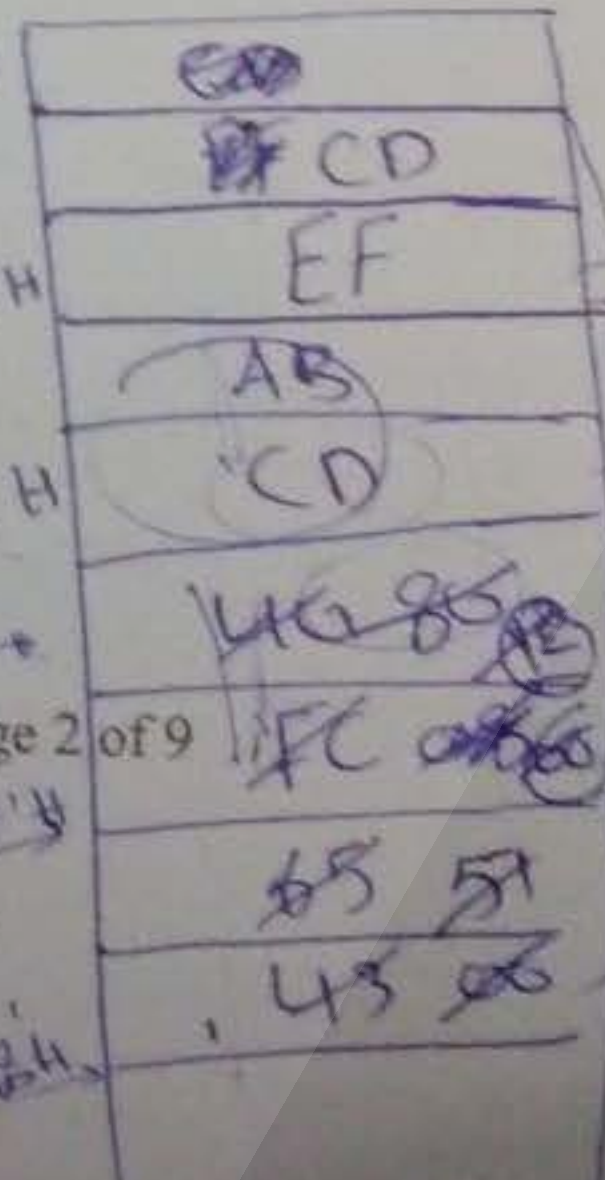
~~DI = 0CDEFH~~  
~~SI = ABCDH~~  
~~SP = 4100H~~  
~~BP = 9FC4H~~  
 DI = 40FC H  
~~BP = 9FC4H~~  
 DX = CD40  
 SI = 6543  
 CX = 8008



Question #2 (2.5 Points): Imagine we construct an assembly program that consists of three assembly instructions to perform a certain job. The corresponding logical address is associated with each instruction as shown below:

AX = 1000H  
 ES = 1000H  
 BX = 5100H  
 DX = 7200H  
 CX = 8008H  
 DI = 0CDEFH  
 SI = ABCDH  
 SP = 4100H  
 BP = 9FC4H  
 SP = 40FEH

0018: 0020 Assembly Instruction 1 4100H  
 0018: 0023 Assembly Instruction 2 40FEH  
 0018: 0025 Assembly Instruction 3; three bytes long 40FC H



Answer the following questions:

(A) (1 Point). What are the physical addresses generated to fetch instruction 2 considering real mode memory addressing?

~~001880023~~

Real mode

00180 +  
0023  
-----  
001A3H

Answer

The physical address is (001A3)H & 001A4

(Q) (1.5 Points). What are the physical addresses generated to fetch instruction 3 considering protected mode memory addressing?

001880025

Notes: 1. Consider an 80286 processor that has 24-bit address bus.

2. Figure 1 and Appendix 1 are very beneficial.

000000000000000000011000  
← Calculate  
← RPL

Answer

401010 +  
0025

(401035)H

Descriptor 3  
From Global  
401036  
401037

Local Descriptor Table (LDT): Descriptor 1	LDT: Descriptor 2	LDT: Descriptor 3
00	00	00
00	00	00
FE	FA	FF
10	10	20
00	40	10
00	30	10
FF	FF	00
FF	FF	FF

Global Descriptor Table (GDT): Descriptor 1	GDT: Descriptor 2	GDT: Descriptor 3
00	00	00
00	00	00
9F	9A	9E
10	10	40
00	10	10
00	00	10
11	22	66
FF	FF	FF

Figure 1. Part of global and local descriptor tables where all of the mentioned values are in hex.

Question #3 (2 Points): Classify the following instructions according to their addressing modes?

Instruction	Corresponding addressing mode
MOV CH, 60H	Immediate addressing mode
MOV DX, [BX + DI + 1030H]	Relative Base Plus Index
MOV [2345H], AX	Direct addressing mode
MOV [EBX + 8*ECX], DL	Scale addressing mode

Question #4 (7 Points): State whether each of following instructions is valid or not. If it is invalid, what is the major cause?

Instruction	Valid/invalid	Cause (if invalid)
MOV [DI+4], 0FFFFH	invalid ✓	(not well defined) MOV WORD PTR [DI+4], 0
MOV DX, CL	invalid ✓	mixed sizes
MOV LIST, [BX]	invalid ✓	memory to memory
MOV DX, [CX]	valid ✓	
PUSH CH	invalid ✓	words only
POP CS	invalid ✓	CS can't be destination
MOV CH, ARRAY[BP+DI+DATA]	<del>invalid</del> valid ✓	<del>memory to memory</del>

Question #5 (4 Points): The following table shows the logical memory addresses along with their contents (in hex). You need to consider this table for answering the questions below.

Memory Address	Memory Contents
D000:0000	0B
D000:0001	06
D000:0002	22
D000:0003	55
D000:0004	06
D000:0005	00
D000:0006	FF
D000:0007	CF
D000:0008	EB
D000:0009	2B
D000:000A	08
D000:000B	00
D000:000C	BC
D000:000D	DA
D000:000E	F2
D000:000F	C6

(A) (1 Point). What will be the value of CX after executing the following code?

```
MOV AX, 0D000h
MOV DS, AX
MOV CL, 45H
MOV CH, 32H
```

$AX = \text{D000H}$   
 $DS = \text{D000H}$   
 $CL = 45H$   
 $CH = 32H$

~~$CX = 3245H$~~

Answer

$Cx = 3245H$

(B) (2 Points). What will be the contents of DX and BX after executing the following code?

```

MOV DL, [0008h]
MOV DH, [000Ch]
MOV BX, [0006H]

```

$DL = 0408H$   
 $DH = 00$

$DL = EB$   
 $DH = BC$

Answer

$DX = BC EB H$

$BX = CFFF H$

(C) (1 Point). What will be the contents of AX after executing the following code?

```

MOV SI, [0004h]
MOV BX, [000Ah]
MOV AX, [BX+SI]

```

$SI = 0006$   
 $BX = 0008$

$0006 + 0008 = 000E$

Answer

$AX = C6F2 H$

Question #6 (4 Points): Study the following assembly program, named "Mid", carefully given that the starting offset address of the data segment (DS) is 0100H.

.Model small  
.data

```

0100H DATA1 DW 6733H
0102H DATA2 DW 0002H
0104H DATA3 DW 0FAABH
0106H DATA4 DW 0EBFFH
0108H DATA5 DW 4321H
010AH DATA6 DD 12344321H

```

.code

.startup

```

MOV SI, offset DATA2
MOV BX, DATA2
MOV DX, [BX+SI]
MOV ECX, DATA3[BX+4]

```

.exit  
END

$SI = 0102H$   
 $BX = 0002H$   
 $DX = FAABH$   
 $ECX = 12344321$

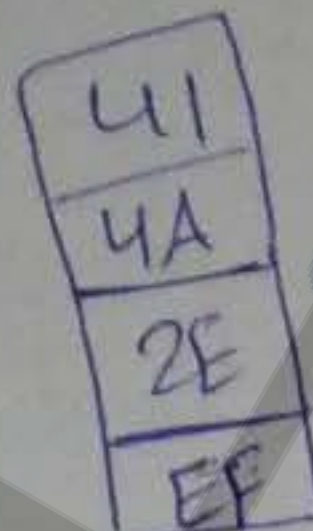
Write down the values of registers SI, BX, DX and ECX after executing the above program?

Answer	SI	BX	DX	ECX
	0102H	0002H	FAABH	12344321H

Question #7 (2.5 Points): The following variables are declared in the data segment where DS = 1000H and the starting offset address is 4000H.

.DATA

4000H X DW 22F2h  
 4002H Y DW 414Ah  
 4004H Z DW 2EEFH  
 4006H K DW 0DECH



(A) (1 Point). What will be the content of DI register after executing the following instruction?

DI = 4002H LEA DI, Y

Answer

DI = 4002H

(B) (1.5 Point). What are the affected parts in the following instruction along with their contents?

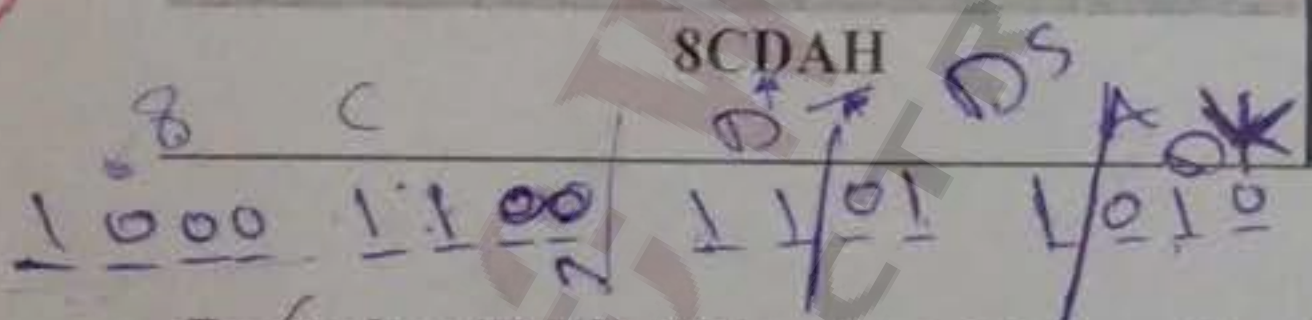
The affected parts are Segment Register (ES) & Register (SI) LES SI, Z

Answer

SI = 2EEFH & ES = 414AH

\* Question #8 (3 Points): Given the following machine instructions. You are required to find their equivalent assembly instructions given working with 16-bit instruction format.

Machine instruction	Equivalent assembly instruction
898D042FH	MOV [DI+2F04], CX
8CDAH	MOV DX, DS



Remarks: (1) The following table provides the opcode of various MOV instructions:

Segment MOV Segment to Segment

Instruction	Opcode
MOV (Immediate)	110001
MOV (Segment)	100011
MOV (Standard)	100010

(2) Appendix II provides several gainful tables.

