

# Practice problems+Assignment+Quiz

**BRAC University**

Semester: Spring 2023  
Course No: CSE341  
Course Title: Microprocessors



## **Assignment 1**

Full Marks: 100

Deadline: **18 February 2023**

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## Practice problems+Assignment

1. A memory location has a physical address of 9A7B1 H. Determine the offset address if the segment number is 40FF H.
2. Explain why a certain physical address in 8086 can have multiple segment addresses. A memory location has a physical address of 80FD2 H. In what segment does it have offset 95A2H?
3. A memory location has the physical address 0F132h. Calculate the corresponding offset addresses of this memory location for the following three segments: (i) 0DA7h, (ii) FFE0h and (iii) F000h
4. Create a block diagram showing the internal architecture of the Intel 8086 and label its components.
5. Explain why we have two different units (i.e., BIU and EU) in an 8086 microprocessor.
6. For the following instructions:

MOV AX, 7EBFh

MOV BX, 4A52h

ADD AX, BX

Find the overflow, parity, auxiliary, zero, and sign flags. Explain the answers for each of the steps.

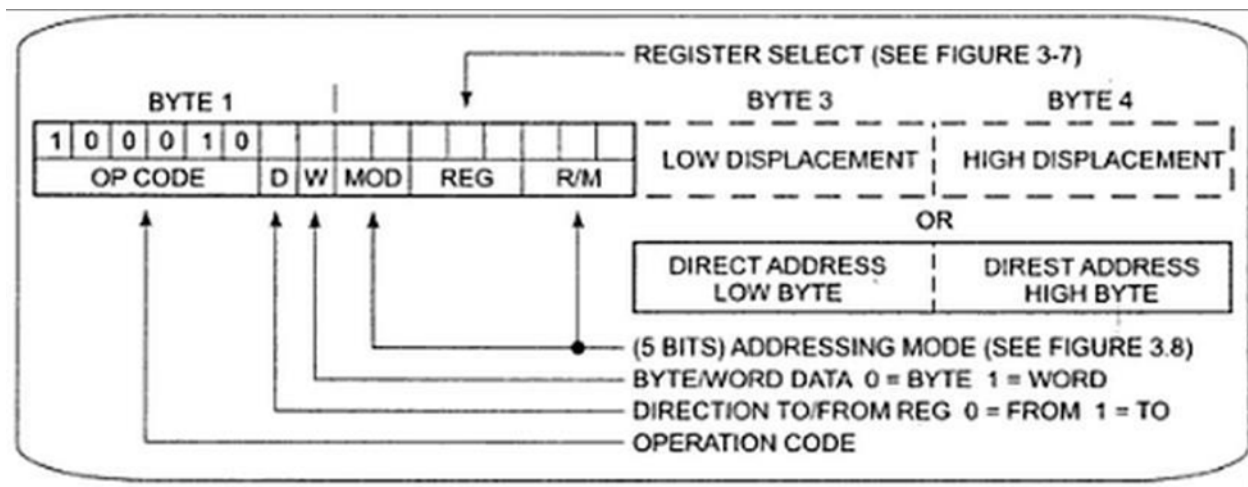
7. State the differences between a microprocessor and a microcontroller.
8. What is memory segmentation? Why is it required?
9. Explain why a logical address is not unique.

10. What is the maximum memory size that can be addressed by the Intel 8086 microprocessor?
11. What is the purpose of the segment registers in the Intel 8086 microprocessor?
12. What is the role of the flags register in the Intel 8086 microprocessor?
13. “The physical address “00045h” can be a part of 3 different segments” – do you agree with the statement?
14. Find out the physical address when
- a. **234D h** is the offset and the base address of the segment is **91AB h** (1 mark)
  - b. **1863 h** is the offset and the base address of the segment is **AA10 h** (1 mark)
  - c. Give an example of a physical address that can have 3 different logical addresses (do not use the example that is given in the slide)
- 15.
- a. Suppose AX contains **EEEEh** and BX contains **BBBBh**. Suppose the instruction “**ADD AX, BX**” is executed. What is the status of **SF, PF, ZF, CF, and OF**? **You have to explain your answer.**
  - b. Suppose AX contains **8000h** and BX contains **1234h**. Suppose the instruction “**ADD AX, BX**” is executed. What is the status of **SF, PF, ZF, CF, and OF**? **You have to explain your answer.**
16. You are given the following instruction: **ADD AX, [10h]**. You are provided the following data: **DS = AB12h; SS = 2567h; CS= 29C1h**. Find the effective address location for the given instruction.
17. Find the smallest and the second largest segment address for each of the following physical addresses. Also, mention the logical addresses (**segment: offset pair**) for each case:
- (a) **FFFEFh**
  - (b) **2h**

18. Explain in detail why 8086 supports a maximum of **1MB of** physical memory.
19. What will be the capacity in **megabytes** of the physical memory of a microprocessor with a **28-bit address bus**? What are the initial and last physical addresses in hexadecimal numbers?
20. Suppose the physical address of a memory location is **33330 H** and the offset is **1111 H**. What is the base address (segment number) of the segment? What is the highest address in that segment (assume nonoverlapping segmentation)?
21. For each of the following statements, state the addressing modes.
- (i) MOV BX, 1000H
  - (ii) MOV DI, 1008H
  - (iii) MOV AX, B [BX+SI+2]; B is an array
  - (iii) MOV AX, B [BX]
22. Use the following charts to answer questions (a) and (b).

MOD = 11			EFFECTIVE ADDRESS CALCULATION			
R/M	W = 0	W = 1	R/M	MOD = 00	MOD = 01	MOD = 10
000	AL	AX	000	(BX) + (SI)	(BX) + (SI) + D8	(BX) + (SI) + D16
001	CL	CX	001	(BX) + (DI)	(BX) + (DI) + D8	(BX) + (DI) + D16
010	DL	DX	010	(BP) + (SI)	(BP) + (SI) + D8	(BP) + (SI) + D16
011	BL	BX	011	(BP) + (DI)	(BP) + (DI) + D8	(BP) + (DI) + D16
100	AH	SP	100	(SI)	(SI) + D8	(SI) + D16
101	CH	BP	101	(DI)	(DI) + D8	(DI) + D16
110	DH	SI	110	DIRECT ADDRESS	(BP) + D8	(BP) + D16
111	BH	DI	111	(BX)	(BX) + D8	(BX) + D16

**Figure:** R/M vs MOD Chart for MOV: 100010 instruction



**Figure:** MOV: 100010 instruction template

- Convert **89806910h** from machine language to its corresponding assembly language. Show all of your work.
- Suppose the instruction **MOV DI, [BP+42h]**, appears in a program. What is its machine language for the given instruction?

## PIC

23. Suppose, you need to service 48 hardware interrupts on your 8086 microprocessor. Explain how many 8259 (PIC) chips you'd need to service the above number of interrupts. Further, explain why only a total of 64 interrupts can be serviced with the help of cascading.

## Memory Banks

24. Explain in how many different ways data can be accessed from the Memory, assuming the memory is divided into even and odd banks. You must explain using the

proper values of A0 and BHE' pins. Why does accessing 16-bit data with an odd starting address require 2 bus cycles instead of 1?

## Timing Diagram

25. Assume an 8086 has been set to operate at 30 MHz and at 40% duty cycle.

Calculate:

- Time for 1 clock pulse
- Time for 1 bus cycle
- Total time in nanoseconds each clock pulse stays low

26. Draw the timing diagram of the Write cycle of an Intel 8086 that is trying to write data to an external I/O. Your diagram must show the states of the following pins:

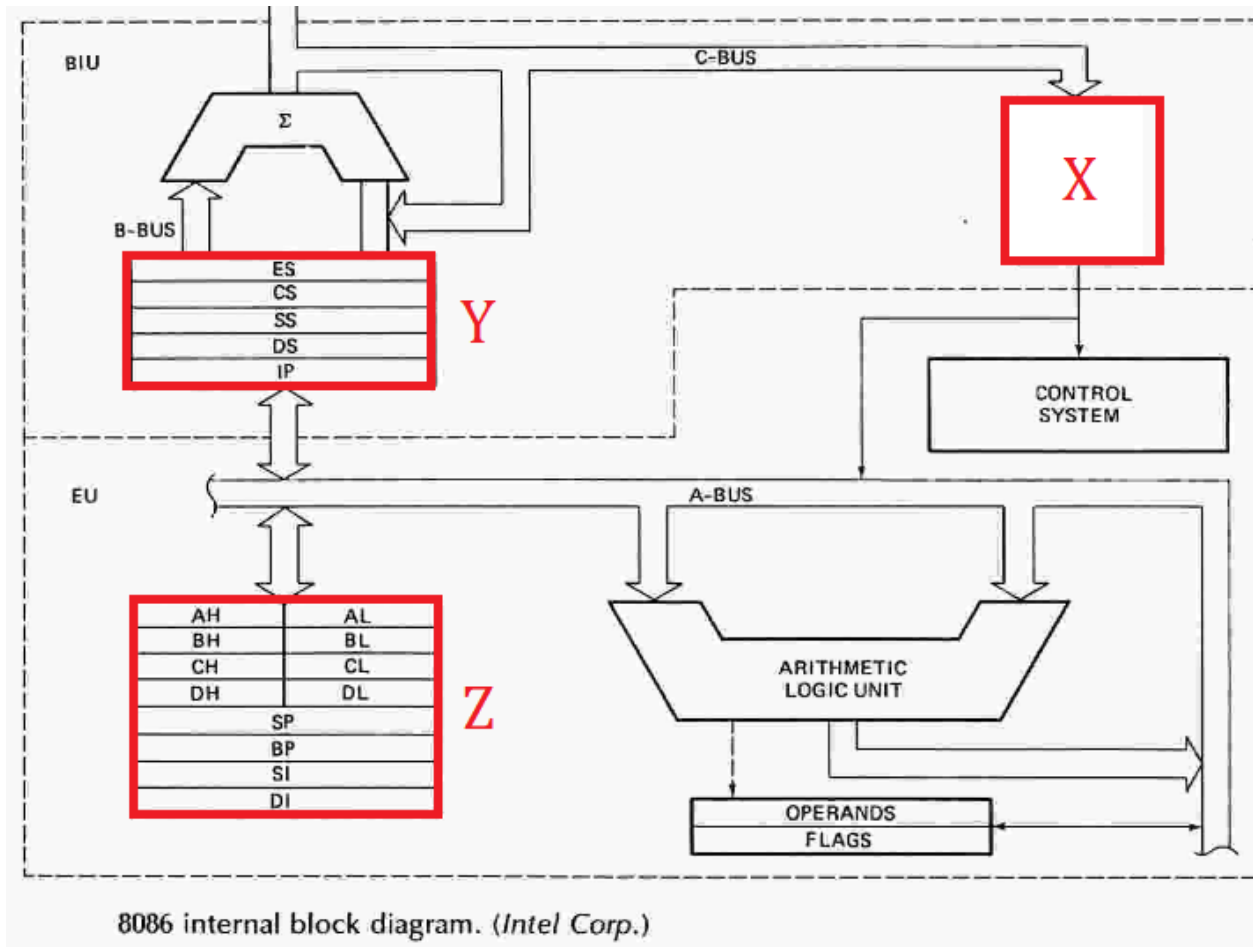
- CLK
- A19-A16
- AD15- AD0
- M/IO'
- ALE
- WR'
- READY
- DEN'

## Interrupt

27. Calculate the locations of CS and IP of the ISR for the interrupt TYPE 123

28. Suppose, the CS of the ISR of an interrupt is found to be in the memory location 2BBh. What could be the type of the interrupt?

# Quiz 1



- Analyze** the Figure shown above.
  - Identify** 'X', 'Y', and 'Z'. **Determine** the necessity of 'X'.
  - Briefly **explain** the differences between 'Y' and 'Z'.
- A 2kB RAM is placed in the memory space with a starting address of 1B800h. What will be the ending address?
- The address **0010:5000 h** contains an instruction. Calculate the value of IP for a program to execute that instruction if **CS is 0000 h**.

## Quiz 2

1. (a) **Explain** to what addressing mode the instruction **IN AL, 05h** belongs. [3]

(b) Calculate the OF, PF, AF, SF, ZF, and CF after the execution of the given instructions.

Explain your reasoning for deducing the flag values: [3.5+3.5]

>>> MOV AX, AB56h

>>> MOV BX, 3965h

>>> ADD AX, BX

2. Suppose you are given the following values; DS = 1234h, CS = 2345h, SS = 3456h, BX = 0010h, DI = 0021h. Additionally, you are also given two instructions:

Instruction 01 >>> **MOV AX, [BP]**

Instruction 02 >>> **MOV [BX+DI+1019H], AX**

Now based on these values answer the following questions: [10]

- Explain with proper reasoning to which addressing mode Instruction 01 belong.
- Calculate what physical address the destination of Instruction 02 refers to. Your final answer should be in hexadecimal.