

COE 205, Term 032
Computer Organization & Assembly Programming
Quiz# 1 (14/03/04)

Student Name: **Key Solution** **ID:** **Section:**

Question 1: Explain the function of each of the following:

i. Assembler:

Translates an assembly language program into machine code

ii. Instruction Pointer (IP).

Points to the next instruction to be fetched from memory (program counter)

iii. Instruction Register (IR).

Contains the machine code of the instruction being executed

Question 2: Name all registers of the 8086 processor. Arrange them in groups.

General Purpose Registers: AX, BX, CX, DX
Index Registers: SI, DI
Base Registers: BP, SP
Segment Registers: DS, ES, CS, SS
Flag Register: FR
Instruction Pointer: IP

Question 3: Determine the machine type and the size of the address and the data buses for the 8086 processor.

20 bit address bus
16 bit data bus → 16 bit processor

Question 4: Determine whether the following operations are performed in the fetch or execute phase:

Instruction	Phase
Reading an instruction from Memory	Fecth
Reading Operands from Memory	Execute
Decoding an Instruction	Decode
Incrementing the Instruction Pointer.	Execute

Question 5: Given two numbers $A = 7FH$ and $B = 3$, assuming that they are represented as 8-bit 2's complement numbers. Perform the following arithmetic operation and indicate whether an *overflow* occurs: $A + B$

$$\begin{array}{r} A = 7FH \quad = 01111111 \\ B = 03H \quad = 00000011 \\ \hline A + B = \quad 11000010 \end{array}$$

There is a carry out of the last 2 bits, hence there is an overflow !

Question 6: Given the binary number 11100010 represented in an 8-bit format. Determine all possible values that this number can represent.

$$\begin{aligned} 11100010 \text{ b} &= E2 \text{ H} \\ &= -1EH = -226 \text{ d} \\ &= \text{ascii code of the dot } \cdot \\ &= \dots \end{aligned}$$

Question 7: Given the following declaration in the logical data segment:

```
.data
A      DB    34H
B      DW    ?
M      EQU   234H
C      DW    'AB'
```

Show how these values would be represented in memory, if we suppose that data is put in memory starting from address: 2000 H

Address	Content
2000	34
2001	?
2002	?
2003	42
2004	41
2005	-
2006	-

Question 8: Based on question 7 and given the following:

$AX = F2E9H$ $BX = 0000H$ $CX = 08A0H$ $DX = F1E0H$
 $SI = 0006H$ $DI = 0010H$ $BP = C2E1H$ $SP = 1330H$
 $DS = 1EC0H$ $ES = 2FF4H$ $CS = 2ADFH$ $SS = 5000H$
 $IP = E731H$

A- Calculate the physical address of the next instruction to be fetched

$$\begin{aligned} PA = CS \times 10H + IP &= 2ADF \times 10 + E731 \\ &= 2ADF0 + E731 \\ &= 39521h \end{aligned}$$

B - Calculate the physical address of the source operand in the following instruction:

MOV AX, Word PTR C

$$\begin{aligned} PA = DS \times 10H + OFFSET(C) &= 1EC0H \times 10 + 2003 \\ &= 1EC00 + 2003 \\ &= 20C03 h \end{aligned}$$

C - What would be the content of the register AX after executing the above instruction:

Content of AX = 4142H