COE 205, Term 101

## Computer Organization \& Assembly Programming

## HW\# 3

Q.1. Consider a program that has the following data segment:

| $I$ | $E Q U$ | $07 F h$ |
| :--- | :--- | :--- |
| $J$ | $D B$ | $\ddots 1234$ |
| $K$ | $E Q U$ | 250 |
| $L$ | $D W$ | $0 F F h$ |

Indicate whether the following are valid or invalid 8086 instructions. If invalid, give the reason:

| 1. MOV AL, I+1 | 11. MOV [SI], WORD PTR [DI-1] |
| :--- | :--- |
| 2. MOV [SI], I | 12. INC [DI+1] |
| 3. MOV AX, [BL] | 13. MOV DS, ES |
| 4. MOV AX, J+2 | 14. INC L+1 |
| 5. MOV BX, $2^{*} \mathrm{~J}$ | 15. DEC Byte PTR [SI+DI] |
| 6. MOV BL, K+6 | 16. ADD Byte PTR [BX], $2^{*} \mathrm{I}+1$ |
| 7. MOV L, I | 17. SUB AH, [BX-SI-2] |
| 8. MOV DS, I | 18. IMUL K |
| 9. SUB AX, DS | 19. SUB CX, [AX] |
| 10. ADD AX, J+2[BX] | 20. ADC CX, [BP]2[SI] |

Q.2. Suppose that you have the following initial content of the registers and memory locations:

| AX $=\mathrm{FE} 14 \mathrm{H}$ | $\mathrm{BX}=7 \mathrm{FEDH}$ | $\mathrm{CX}=\mathrm{F} 1 \mathrm{~A} 4 \mathrm{H}$ | $\mathrm{DX}=00 \mathrm{FFH}$ |
| :--- | :--- | :--- | :--- |
| SI $=0010 \mathrm{H}$ | $\mathrm{DI}=0020 \mathrm{H}$ | $\mathrm{DS}=4000 \mathrm{H}$ |  |


| Memory Address | Contents (hex) |
| :---: | :---: |
| $2000: 0010$ | FF |
| 0011 | FA |
| 0012 | BC |
| 0013 | 06 |
| 0014 | FE |
| 0015 | 50 |

Show the content of the destination operand and the state of the flag bits ( $\mathrm{O}, \mathrm{S}, \mathrm{Z}, \mathrm{A}, \mathrm{P}$, and C ) after the execution of the following instructions. Use the initial content of the
registers and memory locations for the execution of each instruction. Suppose that CF is initially set to 1 .

| 1. | ADC BX, CX | 6. NEG Word PTR [BX-7FDCh] |
| :--- | :--- | :--- |
| 2. | INC Byte PTR [DI-16] | 7. MUL DL |
| 3. | SBB BL, AL | 8. IMUL DL |
| 4. | SUB AL, 2+[SI] | 9. DIV Byte PTR [DI-13] |
| 5. | DEC Byte PTR 4[SI] | 10. IDIV CH |

Q.3. Give a single 8086 instruction that performs each of the following operations. Use the appropriate type pointer whenever necessary to avoid ambiguity. CF is the value of the carry bit flag.

1. $[\mathrm{EFA} 2: \mathrm{EFA} 1] \leftarrow[\mathrm{EFA} 2: \mathrm{EFA} 1]-\mathrm{FFh}$
2. $[\mathrm{BX}] \leftarrow 0-[\mathrm{BX}]$
3. $\mathrm{BX} \leftarrow \mathrm{BX}+[\mathrm{BX}+1: \mathrm{BX}]$
4. DX: $\mathrm{AX} \leftarrow \mathrm{AX} * \mathrm{BX}$
5. $\mathrm{AH} \leftarrow \mathrm{AH}-\mathrm{CL}-\mathrm{CF}$
6. $\mathrm{BX} \leftarrow[\mathrm{DI}+\mathrm{BX}-6: \mathrm{DI}+\mathrm{BX}-7]$
Q.4. Write an 8086 assembly program that implements the following C code. Declare variables $I, J, K$, and $L$ as either byte or word variables using the minimum size possible.
```
C version:
Main()
{
    int I, J, K, L;
    I=-4;
    J=30;
    K=(4*I*J)+(I+5*J)+I;
    L=K/I;
    I=I+I;
    J=J-I-1;
}
```

