**Experiment 3**

**Arithmetic Instructions**

**Part 1: Addition, Subtraction & Comparison.**

**Program 1**

: This program illustrates three types of 8086 instructions

addition, subtraction & comparison.

**Procedure:**

1. Write down the following program in the text editor and make #

COM file.

2. Compile & emulate the program to its Hex code.

3. Compare between the assembled and disassembled programs.

4. Write down the machine instructions (Hex code) of the program

5. Use the single step execution command to run the program.

6. Verify the contents of the registers used in each instruction of

this program including the IP in each step of the execution.

**MOV AX, 4000H**

**MOV DS, AX**

**MOV SI, 0400H**

**MOV DX, 2085H**

**ADD DH, DL**

**CMP DH, DL**

**ADD AX, SI**

**SUB AX, SI**

**INC [SI]**

**INC SI**

**DEC AX**

**ADC [SI], AX**

**SBB AX, [SI]**

**HLT**

**HOMEWORK:**

1. Verify the results of the execution of this program by calculating the

results theoretically (using your hands).

2. How does CMP instruction operate?

3. What is the difference between these two instructions:

**INC [SI]**

&

**INC SI**

4. Show how the bits of the flag register change its values after the

execution of each arithmetic instruction.

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**Part 2: Multiplication.**

**Program 2**

: This program illustrates the Multiplication operation in 8086 µp.

**Procedure:**

1. Write down the following program in the text editor and make #

COM file.

2. Compile & emulate the program to its Hex code.

3. Compare between the assembled and disassembled programs.

4. Write down the machine instructions (Hex code) of the pro gram

5. Use the single step execution command to run the program.

6. Verify the contents of t he registers used in each instruction used in

this program including the IP in each step of the execution.

7. Verify the content of the flag register after the execution of each

arithmetic instruction in the program.

**MOV AL, 03H**

**MOV CL, 02H**

**MUL CL**

**MOV AL, 0F7H**

**IMUL CL**

**MUL CX**

**MOV DI, 0FFFCH**

**IMUL DI**

**HLT**

**HOMEWORK:**

1. Verify the results of the execution of this program by calculating the

results theoretically (use your hands).

2. What is the result if you interchange the instruction

**IMUL CL**

by

**MUL CL , why**

 ?

3. If CX= ffff and AX=0fff, what is the result for the following

Instructions (explain how):

**IMUL CL**

**MUL CL**

**Part 3: Division.**

**Program 2**

: This program illustrates the division operation in 8086 µp.

**Procedure:**

1. Write down the following program in the text editor and make #

COM file.

2. Compile & emulate the program to its Hex code.

3. Compare between the assembled and disassembled programs.

4. Write down the machine instructions (Hex code) of the program.

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5. Use the single step execution command to run the program.

6. Verify the contents of t he registers used in each instruction used in

this program including the IP in each step of the execution.

7. Verify the content of the flag register after the execution of each

arithmetic instruction in the program.

**MOV AL, 0010H**

**MOV BL, 02H**

**DIV CL**

**MOV BL, FCH**

**IDIV BL**

**HLT**

**HOMEWORK:**

1. Verify the results of the execution of this program by calculating the

results theoretically (using your hands).

2. What are the error types that may happen with the use of DIV

instruction?

3. If

**AX**

= +16 and

**BL**

= -3 what is the result after the execution of the

following instruction:

**IDIV BL**

4. Repeat step 3 for AX= -16 and BL= +3.