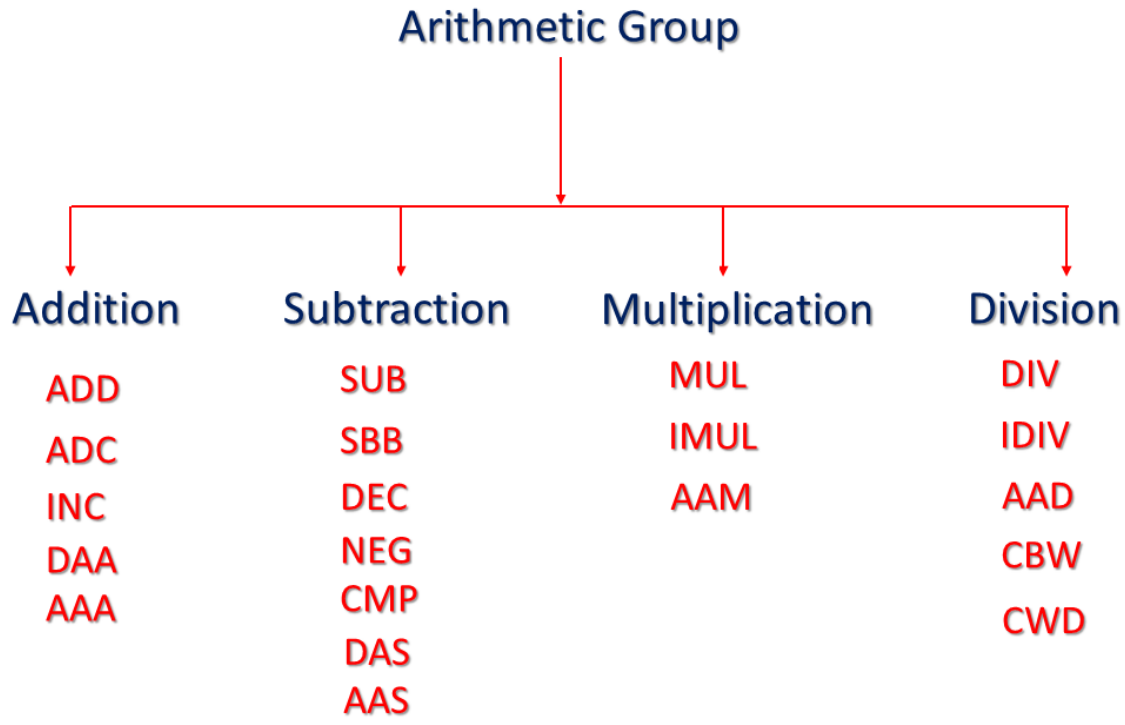
Experiment No: 02 **Date :** _____

Roll No: _____

Aim : **To perform arithmetic operations on 8bit and 16 bit data**

Theory :

Under arithmetic operation, 8086 provides an addition, subtraction multiplication and division. These all operations are performed on the operand (data).



1. **Addition :**

ADD – Add byte or word :

This instruction adds a number from source to number from destination and puts the result to specified destination.

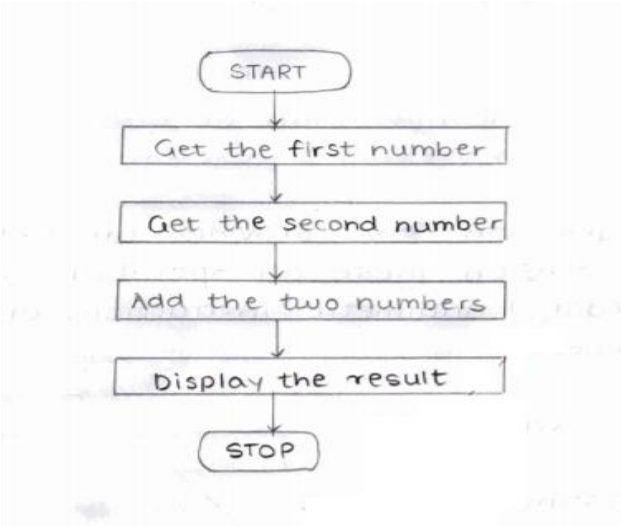
Mnemonic: ADD Destination, Source
ADD Operand 1, Operand 2

Program 1 : WAP for addition of two 8-bit numbers

Algorithm :

Step 1 : Initialize the data segment
Step 2 : Get the first number in AL register
Step 3 : Get the second number in BL register
Step 4 : Add the two numbers
Step 5 : Display result
Step 6 : Stop

Flowchart :



Program :

```
.model small
.data
a db 02H
b db 02H
.code
```

```
mov     ax, @data      ; Initialize data section
        mov     ds, ax
        mov     al, a           ; Load number1 in al
        mov     bl, b           ; Load number2 in bl
        add     al, bl          ; add numbers and result in al

        mov     ch, 02h         ; Count of digits to be displayed
        mov     cl, 04h         ; Count to roll by 4 bits
        mov     bh, al          ; Result in reg bh
l2:     rol     bh, cl          ; roll bl so that msb comes to lsb
        mov     dl, bh          ; load dl with data to be displayed
        and     dl, 0fH         ; get only lsb
        cmp     dl, 09          ; check if digit is 0-9 or letter A-F
        jbe     l4
        add     dl, 07          ; if letter add 37H else only add 30H
l4:     add     dl, 30H
        mov     ah, 02h         ; Function 2 under INT 21H (Display character)
        int     21H
        dec     ch              ; Decrement Count
        jnz     l2
        mov     ah, 4CH         ; Terminate Program
        int     21H
        end
```

Steps to display Output :

1. C:\> tasm Flilename.asm
2. C:\> tlink filename.obj
3. C:\> filename

Output : 04

<u>Program 2:</u> WAP for addition of two 16-bit numbers

<u>Algorithm :</u>

Step 1 : Initialize the data segment
Step 2 : Get the first number in AX register
Step 3 : Get the second number in BX register
Step 4 : Add the two numbers
Step 5 : Display result

Step 6 : Stop

Flowchart :

Program :

Steps to display Output :

4. **C:\> tasm Flilename.asm**
5. **C:\> tlink filename.obj**
6. **C:\> filename**

Output : 04

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2. Subtraction :

SUB – Sub byte or word :

This instruction subtract a number from source to number from destination and puts the result to specified destination.

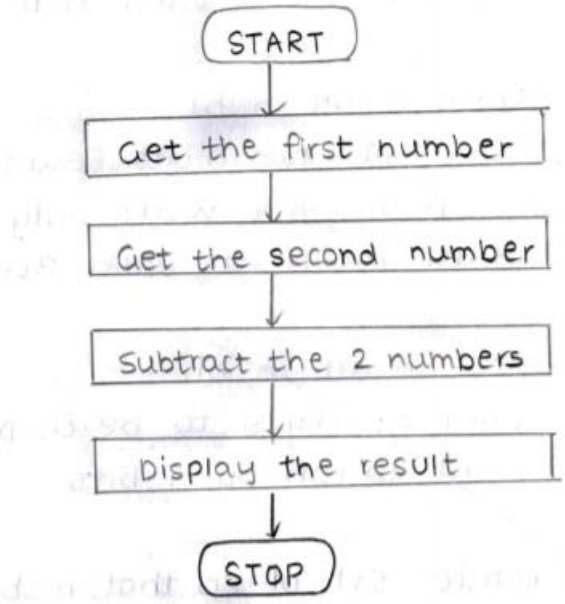
Mnemonic: SUB Destination, Source
SUB Operand 1, Operand 2

Program 1 : WAP for subtraction of two 8-bit numbers

Algorithm :

Step 1 : Initialize the data segment
Step 2 : Get the first number in AL register
Step 3 : Get the second number in BL register
Step 4 : Subtract the two numbers
Step 5 : Display result
Step 6 : Stop

Flowchart :



Program :

```
.model small
.data
a db 02H
b db 02H
.code
mov    ax, @data     ; Initialize data section
       mov    ds, ax
       mov    al, a          ; Load number1 in al
       mov    bl, b          ; Load number2 in bl
       sub    al, bl         ; add numbers and result in al

       mov    ch, 02h        ; Count of digits to be displayed
       mov    cl, 04h        ; Count to roll by 4 bits
       mov    bh, al         ; Result in reg bh
l2:    rol    bh, cl         ; roll bl so that msb comes to lsb
       mov    dl, bh         ; load dl with data to be displayed
       and    dl, 0fH        ; get only lsb
       cmp    dl, 09         ; check if digit is 0-9 or letter A-F
       jbe    l4
       add    dl, 07         ; if letter add 37H else only add 30H
```

```
l4:   add     dl, 30H
      mov     ah, 02h          ; Function 2 under INT 21H (Display character)
      int     21H
      dec     ch               ; Decrement Count
      jnz     l2
      mov     ah, 4CH          ; Terminate Program
      int     21H
      end
```

Steps to display Output :

7. C:\> tasm Flilename.asm
8. C:\> tlink filename.obj
9. C:\> filename

Output : 00

Program 2: WAP for subtraction of two 16-bit numbers

Algorithm :

Step 1 : Initialize the data segment
Step 2 : Get the first number in AX register
Step 3 : Get the second number in BX register
Step 4 : subtract the two numbers
Step 5 : Display result
Step 6 : Stop

Flowchart :

Program :

Steps to display Output :

1. C:\> tasm Flilename.asm

2. **C:\> tlink filename.obj**
3. **C:\> filename**

Output :

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4. **Multiplication :**

- This instruction multiplies an unsigned byte from source with an byte in the AL register or an unsigned word from source with an unsigned word in AX.
- When a byte is multiplied by contents of AL, the result is stored in AX.
- The MSB of result is stored in AH register and the LSB of result is stored in the AL register.

Mnemonic: **MUL** multiplier

Program 1: WAP for multiplication of two 8-bit numbers

Algorithm :

Flowchart :

Program :

Steps to display Output :

Output:

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5. **Division :**

- This instruction divides an unsigned byte from source with an byte in the AL register or an unsigned word from source with an unsigned word in AX.
- When a byte is divided , the result is stored in AX.
  The remainder of result is stored in AH register and quotient of result is stored in the AL register.

Mnemonic: **DIV** multiplier

Program 1: WAP for division of two 8-bit numbers

Algorithm :

Flowchart :

Program :

Steps to display Output :

Output:

Conclusion :