Lab 1: Arithmetic Operations

1 Problem Statement

Write assembly program to:

1. Add two 8-bit numbers:
    (a) Store two 8-bit numbers in consecutive locations starting from 7501H
    (b) Perform addition of these numbers
    (c) Store the result in memory location 7503.
2. Subtract two 8-bit numbers:
    (a) Store two 8-bit numbers in consecutive locations starting from 7501H
    (b) Perform subtraction of these numbers
    (c) Store the result in memory location 7503.
3. Addition two 16-bit numbers:
    (a) Store two 16-bit numbers in consecutive locations starting from 7601H
    (b) Perform addition of these numbers
    (c) Store the result in memory location starting from 7500 and carry in 7502.

2 Procedure

2.1 Sequence of steps for Addition of two 8-bit numbers

Logic to perform addition of two 8 bit numbers:

Flowchart:

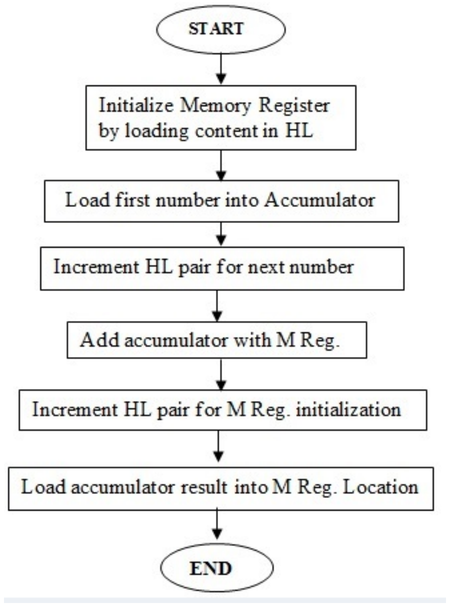
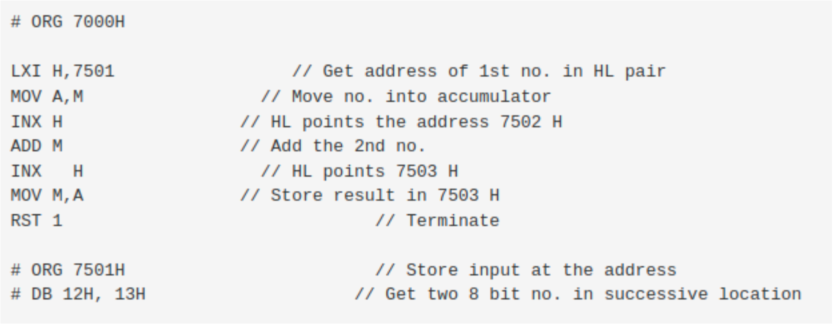

START
Initialize Memory Register by loading content in HL
Load first number into Accumulator
Increment HL pair for next number
Add accumulator with M Reg.
Increment HL pair for M Reg. initialization
Load accumulator result into M Reg. Location
END

Figure 1: Flowchart for addition of two 8-bit numbers

Assembly code:



```
# ORG 7000H

LXI H,7501                 // Get address of 1st no. in HL pair
MOV A,M                 // Move no. into accumulator
INX H                 // HL points the address 7502 H
ADD M                 // Add the 2nd no.
INX   H                 // HL points 7503 H
MOV M,A               // Store result in 7503 H
RST 1                              // Terminate

# ORG 7501H                        // Store input at the address
# DB 12H, 13H                    // Get two 8 bit no. in successive location
```

Figure 2: Assembly code for addition of two 8-bit numbers

2.2 Sequence of steps for Subtraction of two 8-bit numbers

Logic to perform subtraction of two 8 bit numbers:

Flowchart:

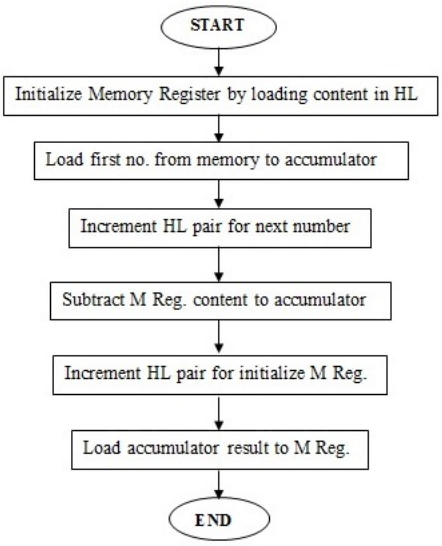

START
Initialize Memory Register by loading content in HL
Load first no. from memory to accumulator
Increment HL pair for next number
Subtract M Reg. content to accumulator
Increment HL pair for initialize M Reg.
Load accumulator result to M Reg.
END

Figure 3: Flowchart for addition of two 8-bit numbers

2.3 Sequence of steps for Addition of two 16-bit numbers

Logic to perform addition of two 16 bit numbers:

Flowchart:

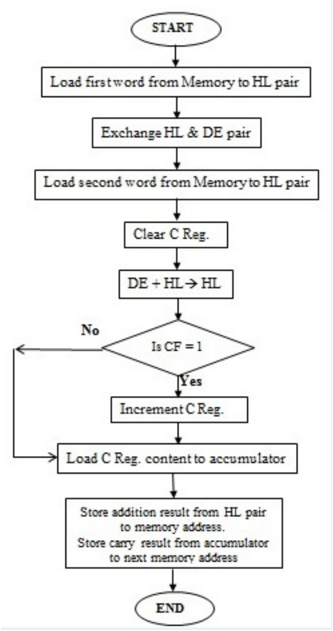

START
Load first word from Memory to HL pair
Exchange HL & DE pair
Load second word from Memory to HL pair
Clear C Reg.
DE + HL → HL
No
Is CF = 1
Yes
Increment C Reg.
Load C Reg. content to accumulator
Store addition result from HL pair to memory address.
Store carry result from accumulator to next memory address
END

Figure 4: Flowchart for addition of two 16-bit numbers

Pseudocode:

```
# ORG 7000H
```

```
      //Get  1st no. in HL pair from memory 7601 H
      //Exchange cont. of DE       HL
      //Get  2st no. in HL pair from location 7603 H
      //Clear reg. C.
      //Get HL+DE & store result in HL
      //If no carry move to store_sum/if carry then move to next step.
      //Increment reg.C
      //Move carry from reg. C to reg. A
      //Store carry at 7502 H
store_sum:
      //Store result in 7500 H.
RST 1

#ORG 7601H
      // Get two 16 bit no. in successive location
```