Exp No: 7 **Date:** 08/10/2020

BCD ADDITION AND SUBTRACTION **Name:** Swetha Saseendran

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## Aim:

To program and execute 8 bit BCD Addition and Subtraction using DOS-BOX.

# (i) BCD Addition

## Programs:

## Algorithm:

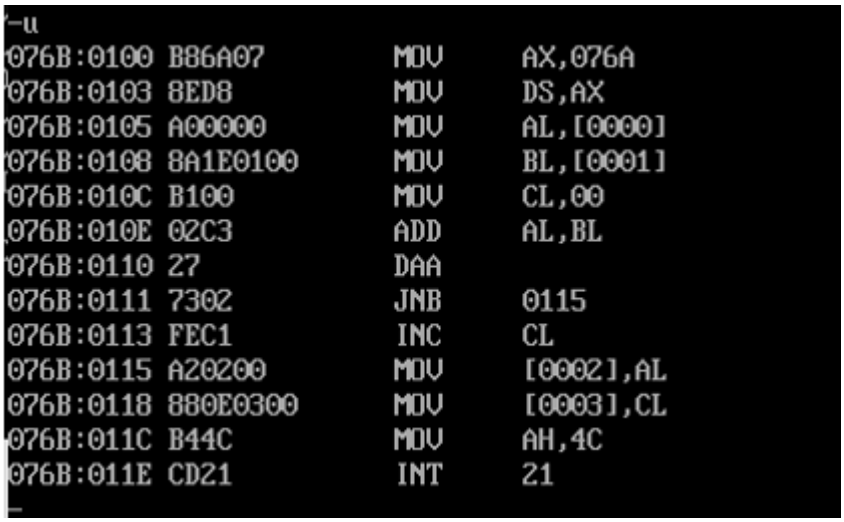
- Program is set to run from any specified memory position.
- Load data from opr1 to register AL (first operand)
- Load data from opr2 to register BL (second operand)
- Initialize carry to 0.
- Add these two numbers (contents of register AL and register BL)
- Decimal adjust after addition
- Jump to here label if there is no carry.
- Increment carry. Store additional values to result.
- Store additional values to result.
- Terminate the program.

| *Program* | *Comments* |
|---|---|
| ***assume*** *cs:code, ds:data* | Using assume directive to declare data, extra and code segment |
| ***data segment*** | Declaring and initialising variables in data segment |
| *opr1 db 11h* | |
| *opr2 db 99h* | |

| | |
|---|---|
| *result db 00h* | |
| *carry db 00h* | |
| ***data ends*** | Data segment ends |
| ***code segment*** | Start of code segment |
| *org 0100h* | Originating address ←0100 |
| ***start:*** | |
| *mov ax, data* | AX ←data |
| *mov ds, ax* | DS←ax |
| *mov al, opr1* | Move opr1 to AL register |
| *mov bl, opr2* | Move opr2 to BL register |
| *mov cl,00h* | CL←00h |
| *add al, bl* | AL=AL+BL |
| *daa* | Decimal adjust after addition |
| *jnc here* | Jump if no carry to here |
| *inc cl* | Increment CL |
| ***here:*** | |
| *mov result, al* | Result ←AL |
| *mov carry, cl* | Move opr1 to AL register |
| *Mov ah, 4ch* | AH←4Ch |
| *int 21h* | When Software interrupt 21 is called with AH=4C, then current process terminates. (i.e., These two instructions are used for the termination of the process). |

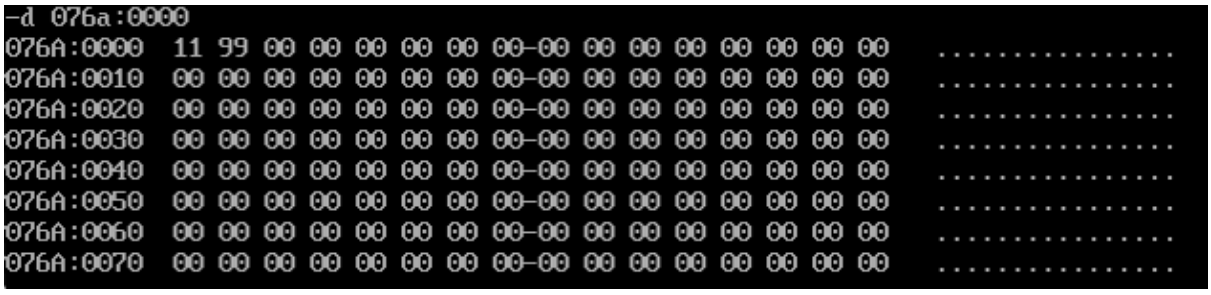
| | |
|---|---|
| *code ends* | Code segment ends |
| *end start* | End of start label |

## Unassembled Code:

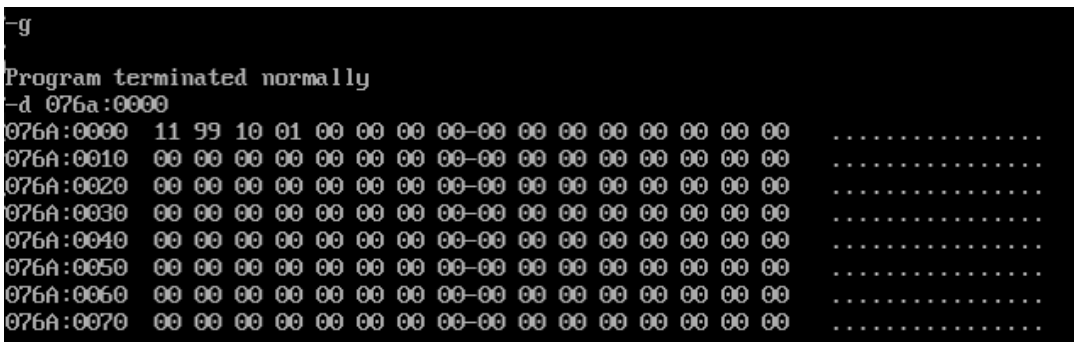



## Snapshot of sample input and output:

INPUT:




OUTPUT:



# (ii) BCD Subtraction

## Algorithm:

- Program is set to run from any specified memory position.
- Load data from opr1 to register AL (first operand)
- Load data from opr2 to register BL (second operand)
- Initialize carry to 0.
- Subtract these two numbers (contents of register AL and register BL)
- Decimal adjust after subtraction
- Jump to here label if there is no carry.
- Increment carry. Store additional values to result.
- Store additional values to result.
- Terminate the program

| *Program* | *Comments* |
|---|---|
| ***assume*** *cs:code,ds:data* | Using assume directive to declare data, extra and code segment |
| ***data segment*** | Declaring and initialising variables in data segment |
| *opr1 db 11h* | |
| *opr2 db 99h* | |
| *result db 00h* | |
| *carry db 00h* | |
| ***data ends*** | Data segment ends |
| ***code segment*** | Start of code segment |
| *org 0100h* | Originating address ←0100 |
| ***start:*** | |
| *mov ax,data* | AX ←data |

| | |
|---|---|
| *mov ds,ax* | DS←ax |
| *mov al, opr1* | Move opr1 to AL register |
| *mov bl, opr2* | Move opr2 to BL register |
| *mov cl, 00h* | CL←00h |
| *sub al, bl* | AL=AL-BL |
| *das* | Decimal adjust after subtraction |
| *jnc here* | Jump if no carry to here |
| *inc cl* | Increment CL |
| *mov dl, 99h* | DL←99h |
| *sub dl, al* | DL=DL-AL |
| *add dl, 01h* | DL=DL+01h |
| *mov al, dl* | Move value in DL to AL |
| *daa* | |
| *here:* | |
| *mov result, al* | Result ←AL |
| *mov carry, cl* | carry←CL |
| *mov ah, 4ch* | AH←4Ch |
| *int 21h* | When Software interrupt 21 is called with AH=4C, then current process terminates. (i.e., These two instructions are used for the termination of the process). |
| *code ends* | Code segment ends |
| *end start* | End of start label |

## Unassembled Code:

```
-u
076B:0100 B86A07        MOV     AX,076A
076B:0103 8ED8          MOV     DS,AX
076B:0105 A00000        MOV     AL,[0000]
076B:0108 8A1E0100      MOV     BL,[0001]
076B:010C B100          MOV     CL,00
076B:010E 2AC3          SUB     AL,BL
076B:0110 2F            DAS
076B:0111 730C          JNB     011F
076B:0113 FEC1          INC     CL
076B:0115 B299          MOV     DL,99
076B:0117 2AD0          SUB     DL,AL
076B:0119 80C201        ADD     DL,01
076B:011C 8AC2          MOV     AL,DL
076B:011E 27            DAA
076B:011F A20200        MOV     [0002],AL
```

## Snapshot of sample input and output:

INPUT:

```
-d 076a:0000
076A:0000  11 99 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0010  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0020  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0030  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0040  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0050  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0060  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0070  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
```

OUTPUT:

```
-g

Program terminated normally
-d 076a:0000
076A:0000  11 99 88 01 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0010  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0020  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0030  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0040  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0050  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0060  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0070  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
-
```

## Result:

8-bit BCD Addition and Subtraction have been programmed and executed in 8086 microprocessor using DOS-BOX.