CSE 331L / EEE 332L

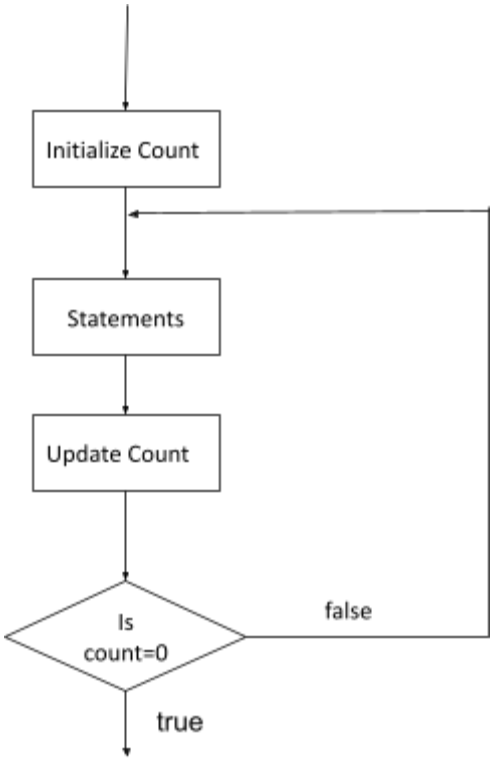
Microprocessor Interfacing & Embedded System

Section: 2, Summer 2021

Lab- 04: Flow-Control Instructions

Example 1: Write a count-controlled loop to print a row of 80 '#'s

```
MOV DL, '#'
MOV AH, 2
MOV CX, 80

_LOOP:
INT 21H

LOOP _LOOP
```



Example2: Write a program to take 8 single-key inputs

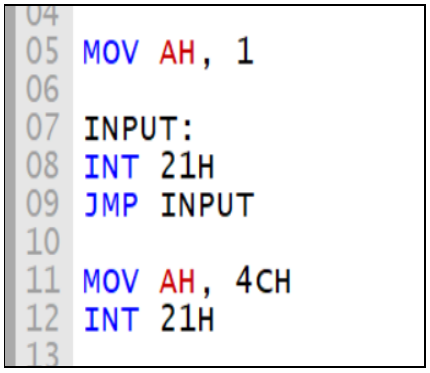
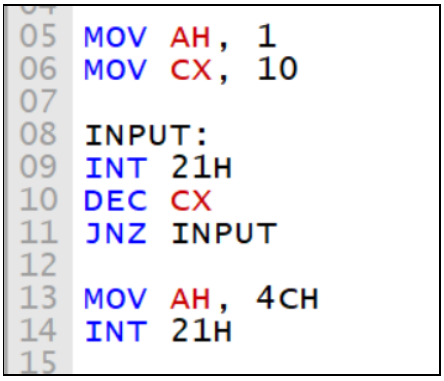
```
MOV AH, 1
MOV CX, 8

INPUT:
INT 21H

LOOP INPUT
```

Example3: write a program to print the first five digits (0,1,2,3,4)

```
MOV AH, 2
MOV CX, 5
MOV DL, 30H

_LOOP:
INT 21H
INC DL

LOOP _LOOP
```

Example 4: Declare an array of size 10 without any initial data. Prompt the user to enter a line of text and store it into the array.

```
.MODEL SMALL
.STACK 100H
.DATA
    MSG DB "Enter a text$"
    ARRAY DB 10 DUP(?), '$'
    NEWL DB 0AH, 0DH, '$'
.CODE
    MOV AX, @DATA
    MOV DS, AX

    MOV CX, 10
    MOV AH, 1
    LEA SI, ARRAY

    _IN:
    INT 21H
    MOV [SI], AL
    INC SI

    LOOP _IN

    MOV AH, 9
    LEA DX, NEWL
    INT 21H
    LEA DX, ARRAY
    INT 21H

    MOV AH, 4CH
    INT 21H
```

Unconditional Jump:	**Conditional Jump:**
Example: Write a program to take single-key inputs.	Example: Write a program to take 10 single-key inputs.
	

```
05 MOV AH, 1
06
07 INPUT:
08 INT 21H
09 JMP INPUT
10
11 MOV AH, 4CH
12 INT 21H
13
```

```
05 MOV AH, 1
06 MOV CX, 10
07
08 INPUT:
09 INT 21H
10 DEC CX
11 JNZ INPUT
12
13 MOV AH, 4CH
14 INT 21H
15
```

Signed	**Unsigned**
JE/JZ Jump Equal or Jump Zero **JNE/JNZ** Jump not Equal or Jump Not Zero **JG/JNLE** Jump Greater or Jump Not Less/Equal **JGE/JNL** Jump Greater/Equal or Jump Not Less **JL/JNGE** Jump Less or Jump Not Greater/Equal **JLE/JNG** Jump Less/Equal or Jump Not Greater	**JE/JZ** Jump Equal or Jump Zero **JNE/JNZ** Jump not Equal or Jump Not Zero **JA/JNBE** Jump Above or Jump Not Below/Equal **JAE/JNB** Jump Above/Equal or Jump Not Below **JB/JNAE** Jump Below or Jump Not Above/Equal **JBE/JNA** Jump Below/Equal or Jump Not Above

Example 7: Write a program to take 10 single-key inputs. Terminate the program if the number of user input keys exceed the given size or user inputs a carriage return.

```
04
05 MOV AH, 1
06 MOV CX, 10
07
08 INPUT:
09 INT 21H
10
11 CMP AL, 0DH
12 JE EXIT
13
14 DEC CX
15 JNZ INPUT
16
17 EXIT:
18 MOV AH, 4CH
19 INT 21H
20
```

Example 8: Take a user input; if the input is character '1' display 'O', if it is '2', display "E", if it is anything else, do nothing.

```
05 MOV AH, 1
06 MOV CX, 10
07 INT 21H
08
09 CMP AL, '1'
10 JE PRINT_O   ;if(input==1), goto label(line 18)
11              ;else goto next instruction(line 13)
12
13 CMP AL, 32H
14 JE PRINT_E   ;if(input==2), goto label(line 25)
15              ;else goto next instruction(line 16)
16 JMP EXIT     ;goto exit & thus skip line 18-28
17
18 PRINT_O:
19 MOV AH, 2
20 MOV DL, 'O'
21 INT 21H      ;print 'O'
22
23 JMP EXIT     ;goto exit & thus skip line 25-28
24
25 PRINT_E:
26 MOV AH, 2
27 MOV DL, 'E'
28 INT 21H      ;print 'E'
29
30 EXIT:
31 MOV AH, 4CH
32 INT 21H
33
```

TEST:

Format: **TEST destination, souce** Example: **TEST AL, 1** **TEST and AND are similar, the only difference is TEST doesn't write the result of the operation on destination.	AL: 1001 1011 (155) 0000 0001 --- 0000 0001 => not zero => odd AL: 1001 1010 (154) 0000 0001 --- 0000 0000 => zero => even

Example: Read a character and check if the input contains an even number. If it is even, print 'e' otherwise do nothing.

```
MOV AH, 1
INT 21H
XOR AH, AH  ;set ah to 0
MOV BL, 2

DIV BL      ;AX/BL: quotient in al,
            ;remainder in ah

CMP AH, 0   ;check if remainder is 0
            ;means even number
JE PRINT_E  ;goto label

JMP EXIT    ;if not even, goto exit

PRINT_E:
MOV AH, 2
MOV DL, 'E'
INT 21H     ;print 'E'

EXIT:
MOV AH, 4CH
INT 21H
```

```
MOV AH, 1
INT 21H

TEST AL, 1
;checks if LSB is zero
JZ PRINT_E

JMP EXIT
;if not even, goto exit

PRINT_E:
MOV AH, 2
MOV DL, 'E'
INT 21H

EXIT:
MOV AH, 4CH
INT 21H
```