Microprocessors and Interfaces: 2021-22
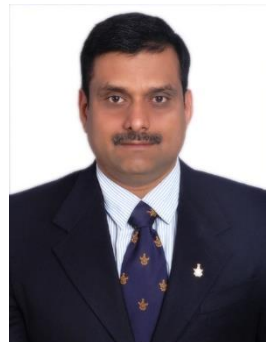# Lab 3
8086 Programming
1. Temperature Conversion from ^0F to ^0C & ^0K
2. Factorial of a Number
By Dr. Sanjay Vidhyadharan

- 3.1 Conversion of temperature

- **Objective**: Convert the given temperature in Celsius scale to Fahrenheit scale.

- <u>Required Formula:</u>

- $\dfrac{C}{5} = \dfrac{F-32}{9}$

- $F = \dfrac{9C}{5} + 32$

- Conversion of Temperature

- **Sample : Convert the given temperature in Celsius scale to Fahrenheit scale.**

```
org 100h
mov [2000H], 10
mov cl, [2000H]
mov al,9
imul cl
mov cl,5
idiv cl
add al,32
mov  [2001H], al
ret
```

- ## Variables

Sample : Convert the given temperature in Celsius scale to Fahrenheit scale.

```
org 100h
jmp start
tc db 10
tf db ?

start:
mov cl, tc
mov al,9
imul cl
mov cl,5
idiv cl
add al,32
mov  tf, al
LEA    BX, tf
ret
```

- # Problem Statement

3.1 Write a program to read ^0F from memory [3000], covert it to ^0C (assign ^0C as variable), Compute ^0K from ^0C and load computed value of ^0K in memory [3001]

• 3.2 Factorial of a given number

- Factorial of the number: n!

- **Example**: 7! = 7 × 6 × 5 × 4 × 3 × 2 × 1 = 5040

- 1! = 1

Calculation of factorial from previous number: n! = n × (n-1)!

n	n!		
1	1	1	1
2	2 × 1	= 2 × 1!	2
3	3 × 2 × 1	= 3 × 2!	6
4	4 × 3 × 2 × 1	= 4 × 3!	24
5	5 × 4 × 3 × 2 × 1	= 5 × 4!	120

- # 3.2 Factorial of a given number

- **Flowchart**

START

SI: Set a value for memory location
Var1: Consider a number between 1 to 8

$CX = (Var1)_{10}$; $AX = (0001)_{16}$
$DX = (0000)_{16}$

AX = AX x CX

CX = CX -1

CX = 0 ?

No

Yes

Store AX → [SI]

END

Loop operation

For this problem consider SI = 0200 H

• 3.2 Factorial of a given number


```
START

SI: Set a value for memory location
Var1: Consider a number between 1 to 8

CX = (Var1)₁₀ ;  AX = (0001)₁₆
            DX = (0000)₁₆

AX = AX x CX

CX = CX -1

CX = 0 ?   No / Yes

Store AX → [SI]

END
```
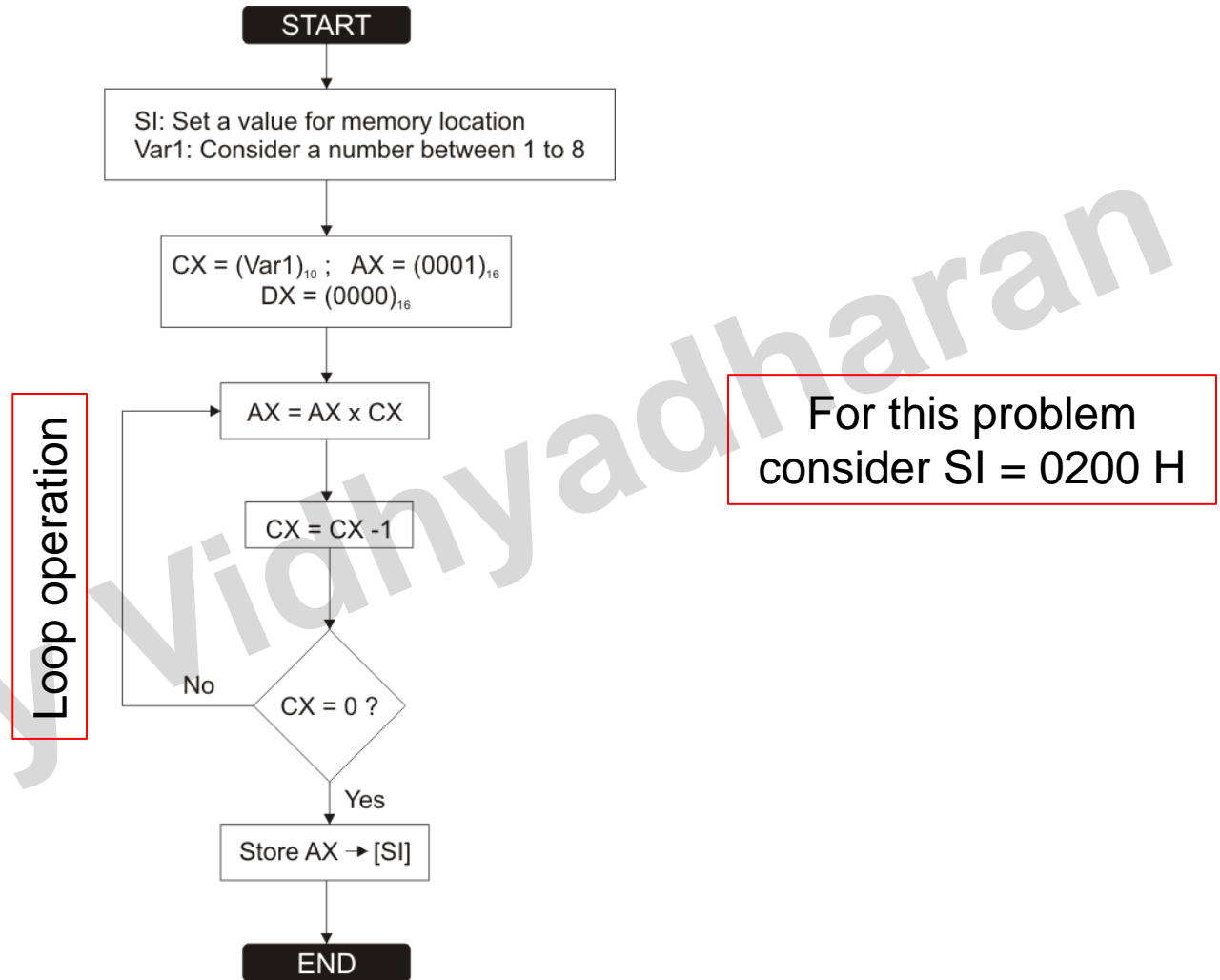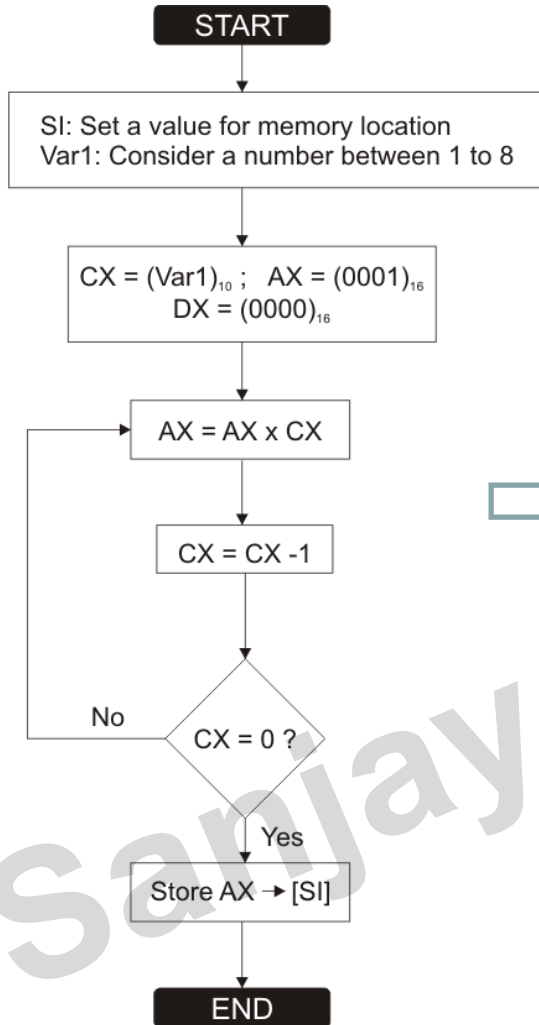
- ## Pseudocode

- `org 100h`

- `MOV SI,` XXXX
- `MOV CX,` YYYY

- `MOV AX,` ZZZZ

- `MOV DX,` WWWW
-
- `L1: MUL` AA
-        `LOOP` PP
- `MOV [SI],`KK

- `HLT`
- `ret`

Values highlighted in yellow color are needed to altered as per the flowchart.

Format for defining label

Complete the code for determination of factorial of a number.

- # 3.2 Review Questions

1. What will be the effect if we consider the number to be 0 in the given pseudocode?

2. Why the input number range is selected between 1 to 8? Can we extend the range by altering the ALP suitable for 8086?

3. Repeat the same problem without using the instructions "LOOP". You can use the instructions like JZ or JNZ or any other registers as per your requirement. Evaluate the value of 7! using your new code.

- Thankyou