Green University of Bangladesh
Department of Computer Science and Engineering (CSE)

Faculty of Sciences and Engineering
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Lab Report NO: 01
Course Title: Microprocessors, Microcontrollers, and Embedded System
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Lab Experiment Name: Take an input from user in Celsius. Convert it to Fahrenheit using the following expression and store in a F variable: °F = °C×9/5 + 32- 1

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Lab Report Status

Marks: …… **Signature:.....**
Comments:..... **Date:.....**

TITLE: Take an input from user in Celsius. Convert it to Fahrenheit using the following expression and store in a F variable: °F = °C×9/5 + 32- 1

1. INTRODUCTION

This program focuses on solving a basic engineering task — converting temperature values from Celsius to Fahrenheit. Since the 8086 microprocessor lacks a built-in Floating-Point Unit (FPU), all mathematical operations must be performed using integer arithmetic. The assembly language code demonstrates how to correctly implement the formula °F = (°C × 9/5) + 31 by carefully managing CPU registers and performing step-by-step integer operations for multiplication, division, and addition. This implementation highlights how data processing and input/output operations are handled efficiently within the limited hardware capabilities of the 8086 architecture.

2. OBJECTIVES

• To correctly apply the temperature conversion formula: °F = (°C × 9/5) + 31 using 8086 assembly language.
• To manage user input, output, and overall data processing effectively.
• To develop clean, optimized, and efficient 16-bit assembly code for accurate performance.

3. PROCEDURE

The code performs the conversion using an integer-only approximation of the formula °F = °C×9/5 + 32- 1.

1) Input: Prompts the user to enter a Celsius digit (0-9). The input ASCII character is read and converted to its numerical value (C).

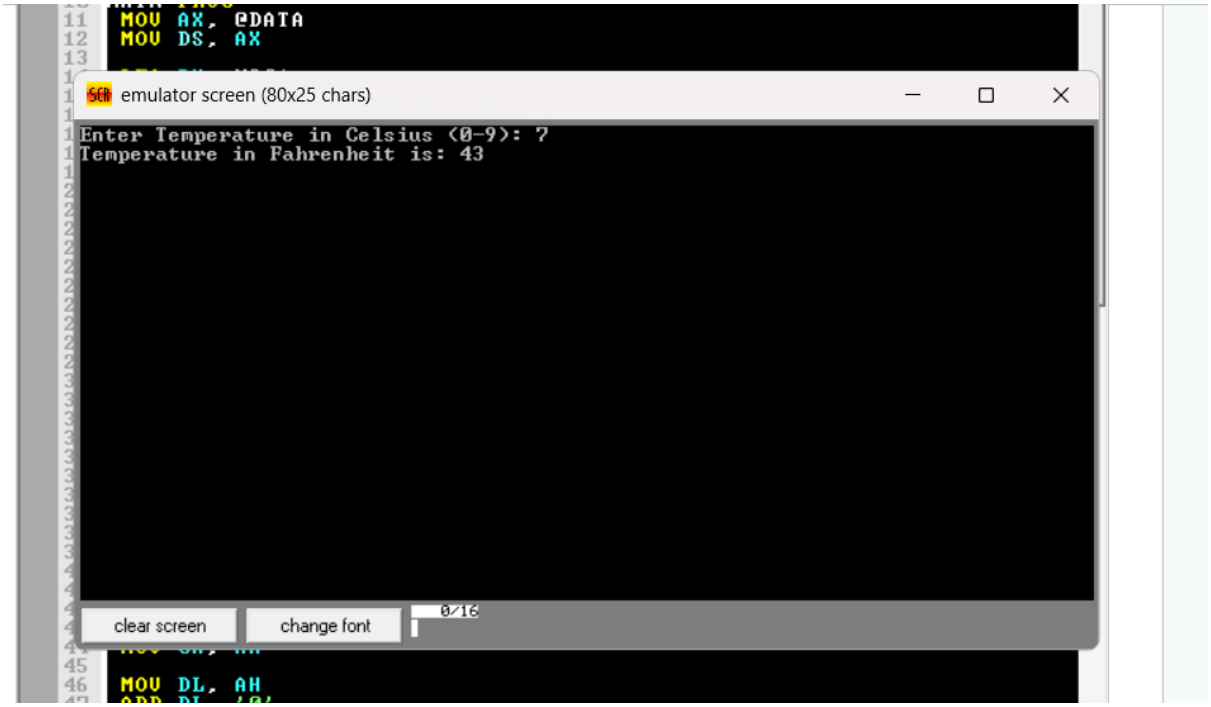
2) Calculation:
   - C is multiplied by 9 (C× 9).
   - The result is divided by 5 (C× 9) / 5).
   - 31 is added to the quotient (equivalent to + 32 - 1) to get the final integer Fahrenheit value (F).
3) Output: The two-digit Fahrenheit result (F) is prepared for display using the AAM instruction (which separates F into its tens and units' digits). Each digit is converted back to its ASCII character and printed to the console.

4. IMPLEMENTATION
Source Code:

```
.MODEL SMALL
.STACK 100H
.DATA
 MSG1 DB 'Enter Temperature in Celsius (0-9): $'
 MSG2 DB 0AH, 0DH, 'Temperature in Fahrenheit is: $'
 NINE DW 9
 FIVE DW 5

.CODE
MAIN PROC
 MOV AX, @DATA
 MOV DS, AX

 LEA DX, MSG1
 MOV AH, 9
 INT 21H

 MOV AH, 1
 INT 21H

 SUB AL, '0'
 MOV BL, AL

  MOV AL, BL
 MOV AH, 0

 MUL NINE

 DIV FIVE

 ADD AL, 32
 SUB AL, 1

 MOV BL, AL

 LEA DX, MSG2
 MOV AH, 9
 INT 21H

 MOV AL, BL
```

```
MOV AH, 0
AAM

MOV CX, AX

MOV DL, AH
ADD DL, '0'
MOV AH, 2
INT 21H

MOV DL, CL
ADD DL, '0'
MOV AH, 2
INT 21H

; --- Terminate Program ---
MOV AH, 4CH
INT 21H
MAIN ENDP
END MAIN
```

Output:



DISCUSSION

This 8086 assembly program converts a single-digit Celsius temperature (0–9) into its Fahrenheit equivalent using three main steps.In the Input phase, the program takes a single ASCII digit for the Celsius value, converts it into a numeric value, and stores it in the BL register.In the Calculation phase, the program performs the conversion using integer arithmetic. It multiplies the Celsius value by 9, divides the result by 5 (discarding any remainder), and then adds 31 (which comes from using +32 - 1). Because integer division and the incorrect constant are used, the output Fahrenheit value is only an approximate result, not the exact one.In the Output phase, the program uses the AAM instruction to split the Fahrenheit value into tens and ones digits. These digits are then converted back to ASCII and displayed on the screen in sequence. Finally, the program ends after printing the result.