Computer Organization and Architecture Lab

LAB ASSIGNMENT – 6

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CSE-F

1 (a) Write a program in assembly language to print single character on screen.

Code:

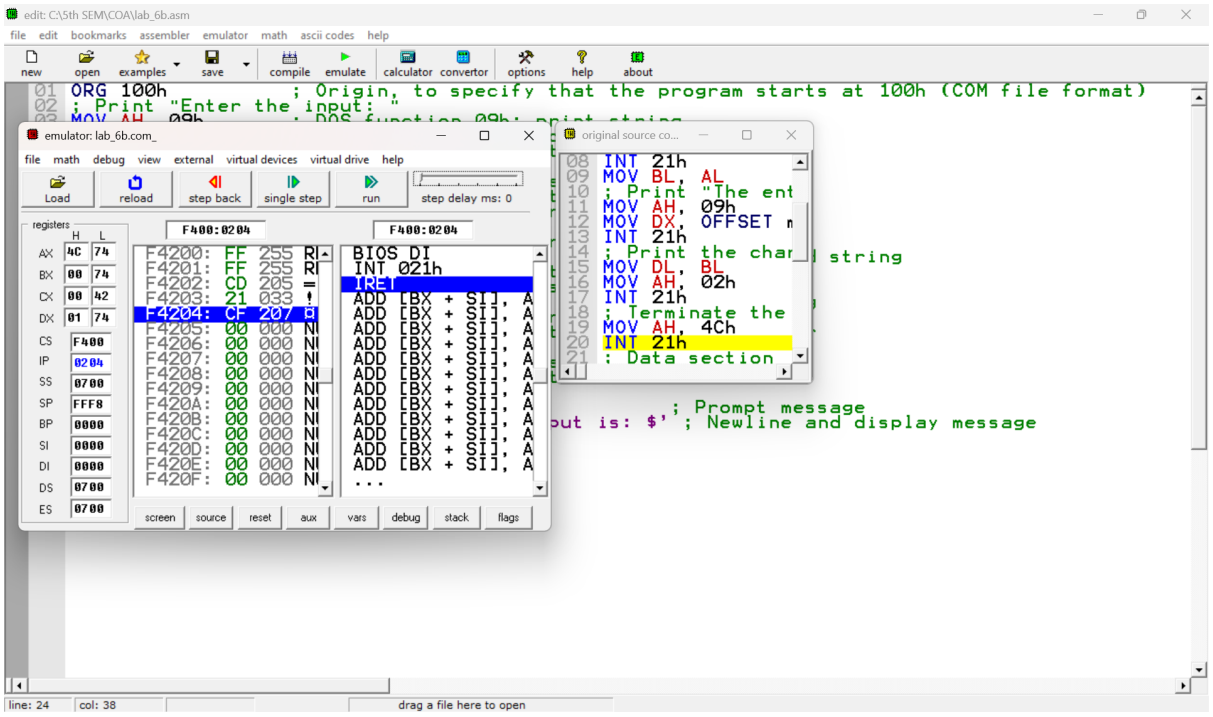
```
ORG 100h        ; Origin, to specify that the program starts at 100h (COM file format)
; Print "Enter the input: "
MOV AH, 09h     ; DOS function 09h: print string
MOV DX, OFFSET msg_enter_input ; Load address of the string
INT 21h         ; Call DOS interrupt to print the string
; Read a single character from user
MOV AH, 01h     ; DOS function 01h: read single character
INT 21h         ; Call DOS interrupt to get the character
MOV BL, AL      ; Store the input character in BL register
; Print "The entered input is: "
MOV AH, 09h     ; DOS function 09h: print string
MOV DX, OFFSET msg_entered_input ; Load address of the second string
INT 21h         ; Call DOS interrupt to print the string
; Print the character stored in BL register
MOV DL, BL      ; Move character from BL to DL for printing
MOV AH, 02h     ; DOS function 02h: print single character
INT 21h         ; Call DOS interrupt to print the character
; Terminate the program
MOV AH, 4Ch     ; DOS function 4Ch: terminate program
INT 21h         ; Call DOS interrupt to exit
; Data section
```

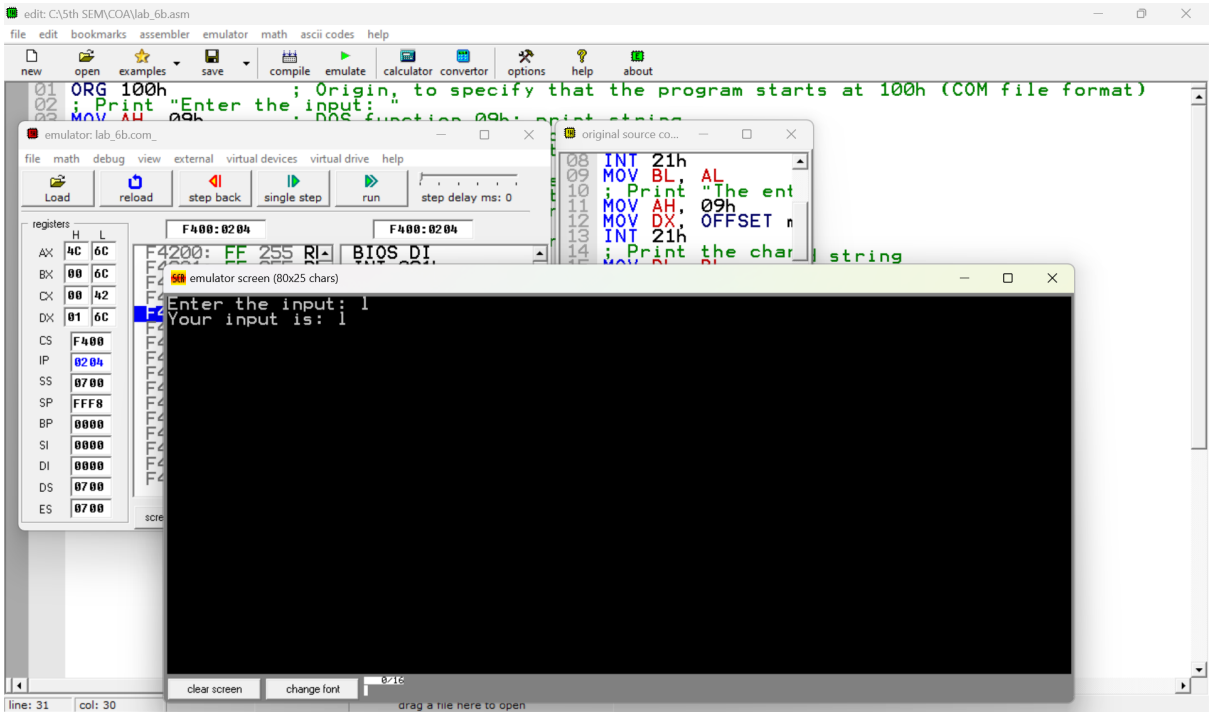
msg_enter_input DB 'Enter the input: $' ; Prompt message

msg_entered_input DB 0Dh, 0Ah, 'Your input is: $' ; Newline and display message

END ; End of program

OUTPUT:





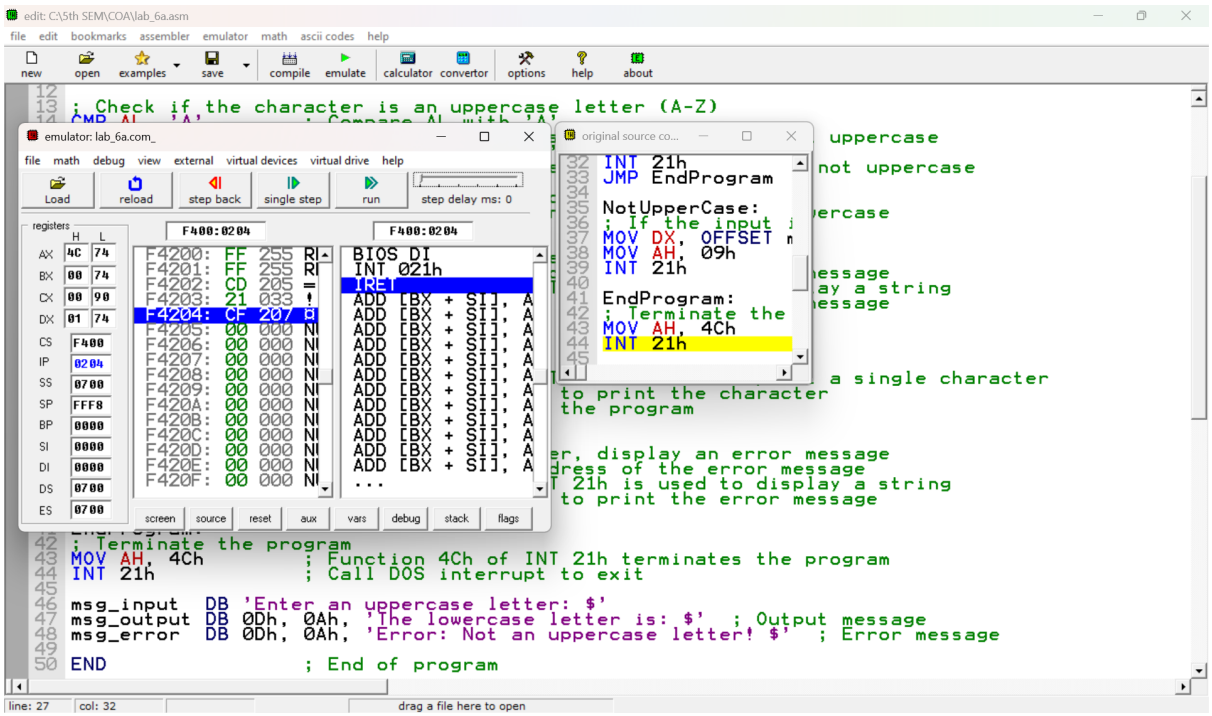
(b) Write an assembly language program to convert an upper-case letter to the corresponding lower-case letter.

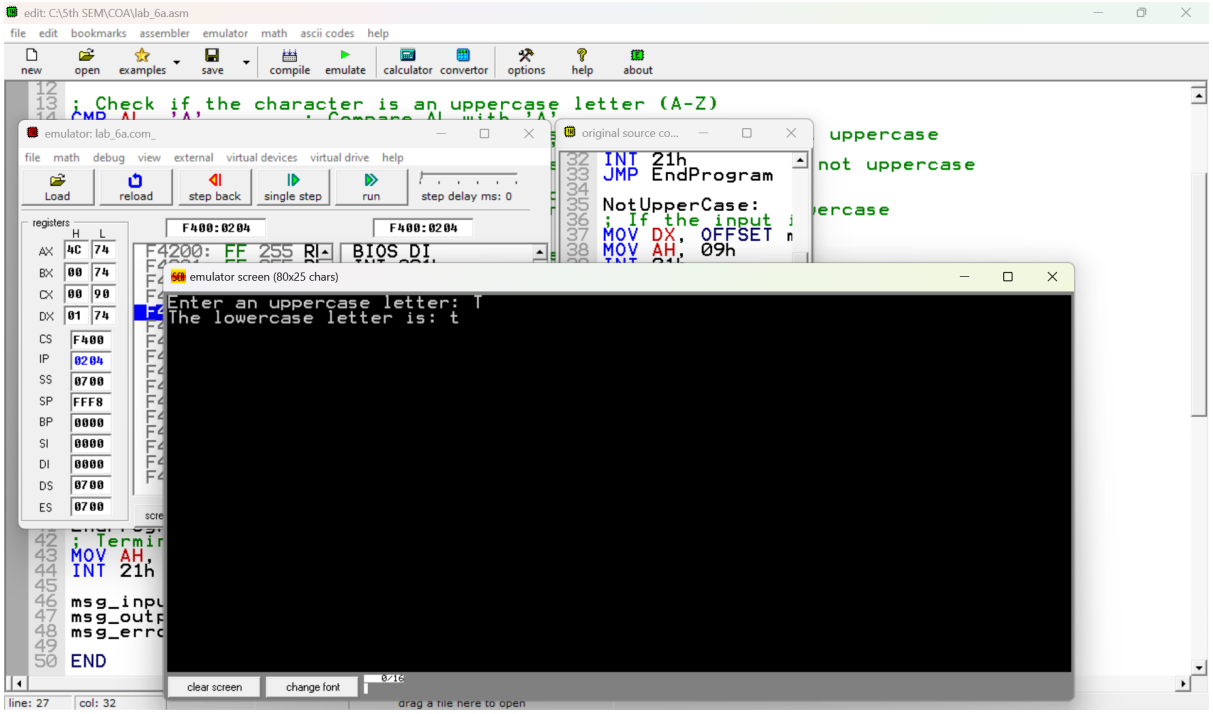
Code:

```
ORG 100h          ; Origin, to specify that the program starts at 100h (COM file format)
; Display message "Enter an uppercase letter: "
MOV DX, OFFSET msg_input  ; Load the address of the message
MOV AH, 09h       ; Function 09h of INT 21h is used to display a string
INT 21h           ; Call DOS interrupt to print the message
; Read a single character from the user
MOV AH, 01h       ; Function 01h of INT 21h is used to read a character
INT 21h           ; Call DOS interrupt to get the character
MOV DL, AL        ; Store the input character in AL
; Check if the character is an uppercase letter (A-Z)
CMP AL, 'A'       ; Compare AL with 'A'
JL NotUpperCase    ; If the input is less than 'A', it is not uppercase
CMP AL, 'Z'       ; Compare AL with 'Z'
JG NotUpperCase    ; If the input is greater than 'Z', it is not uppercase
; Convert the uppercase letter to lowercase
ADD AL, 20h       ; Add 32 (20h) to convert uppercase to lowercase
MOV BL, AL
; Print the message "The lowercase letter is: "
MOV DX, OFFSET msg_output  ; Load the address of the output message
MOV AH, 09h       ; Function 09h of INT 21h is used to display a string
INT 21h           ; Call DOS interrupt to print the output message
MOV AL, BL
; Print the converted lowercase letter
MOV DL, AL        ; Move the lowercase letter to DL
MOV AH, 02h       ; Function 02h of INT 21h is used to print a single character
INT 21h           ; Call DOS interrupt to print the character
JMP EndProgram     ; Jump to the end of the program
NotUpperCase:
```

```
; If the input is not an uppercase letter, display an error message
MOV DX, OFFSET msg_error  ; Load the address of the error message
MOV AH, 09h       ; Function 09h of INT 21h is used to display a string
INT 21h           ; Call DOS interrupt to print the error message
EndProgram:
; Terminate the program
MOV AH, 4Ch       ; Function 4Ch of INT 21h terminates the program
INT 21h           ; Call DOS interrupt to exit
msg_input  DB 'Enter an uppercase letter: $'
msg_output DB 0Dh, 0Ah, 'The lowercase letter is: $'  ; Output message
msg_error  DB 0Dh, 0Ah, 'Error: Not an uppercase letter! $'  ; Error message
END               ; End of program
```

Output:




edit: C:\5th SEM\COA\lab_6a.asm
file edit bookmarks assembler emulator math ascii codes help
new open examples save compile emulate calculator convertor options help about
; Check if the character is an uppercase letter (A-Z)
uppercase
not uppercase
emulator: lab_6a.com_
file math debug view external virtual devices virtual drive help
Load reload step back single step run step delay ms: 0
registers
AX 4C 74
BX 00 74
CX 00 90
DX 01 74
CS F400
IP 0204
SS 0700
SP FFF8
BP 0000
SI 0000
DI 0000
DS 0700
ES 0700
F400:0204
F400:0204
BIOS_DI
original source co...
INT 21h
JMP EndProgram
NotUpperCase:
; If the input
MOV DX, OFFSET
MOV AH, 09h
emulator screen (80x25 chars)
Enter an uppercase letter: T
The lowercase letter is: t
clear screen
change font
; Termir
MOV AH,
INT 21h
msg_inpu
msg_outp
msg_erro
END
line: 27
col: 32
drag a file here to open

Practice set:

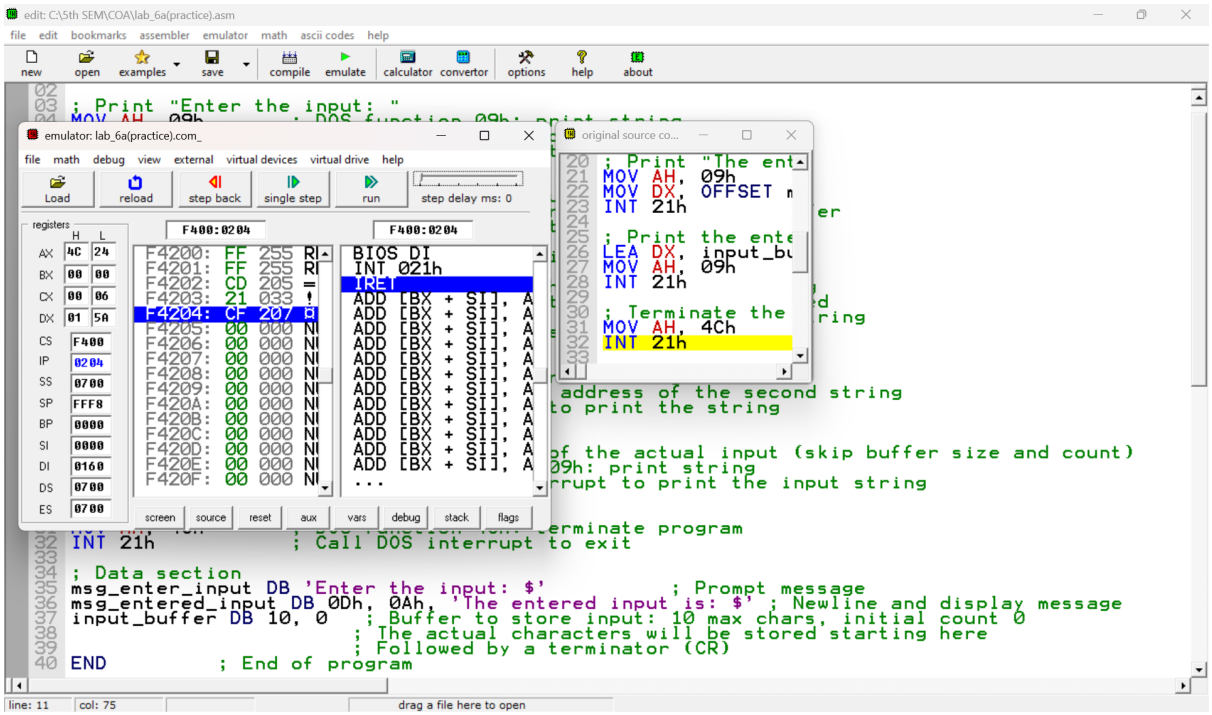
2. (a) Write a program in assembly language to print multiple characters on screen.

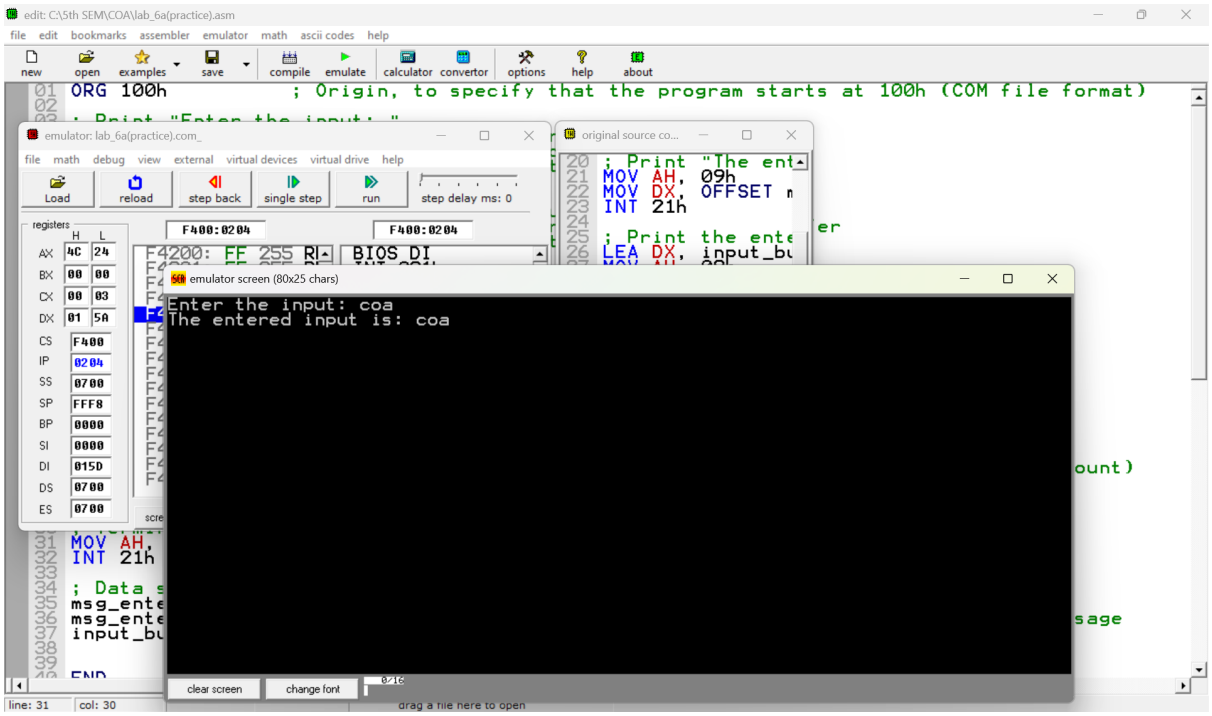
Code:

```
ORG 100h        ; Origin, to specify that the program starts at 100h (COM file format)
; Print "Enter the input: "
MOV AH, 09h     ; DOS function 09h: print string
MOV DX, OFFSET msg_enter_input ; Load address of the string
INT 21h         ; Call DOS interrupt to print the string
; Read multiple characters from user
MOV AH, 0Ah     ; DOS function 0Ah: buffered input
MOV DX, OFFSET input_buffer  ; Load address of the input buffer
INT 21h         ; Call DOS interrupt to read the string
; Add a $ at the end of the entered string for printing
MOV AL, '$'          ; Store $ in AL
LEA DI, input_buffer+2 ; DI points to the actual input string
MOV CL, [input_buffer+1] ; Get the count of characters entered
ADD DI, CX           ; Move DI to the end of the entered string
MOV [DI], AL         ; Insert $ at the end of the string
; Print "The entered input is: "
MOV AH, 09h     ; DOS function 09h: print string
MOV DX, OFFSET msg_entered_input ; Load address of the second string
INT 21h         ; Call DOS interrupt to print the string
; Print the entered string
LEA DX, input_buffer+2  ; Load address of the actual input (skip buffer size and count)
MOV AH, 09h          ; DOS function 09h: print string
INT 21h              ; Call DOS interrupt to print the input string
; Terminate the program
MOV AH, 4Ch     ; DOS function 4Ch: terminate program
INT 21h         ; Call DOS interrupt to exit
; Data section
```

```
msg_enter_input DB 'Enter the input: $'         ; Prompt message
msg_entered_input DB 0Dh, 0Ah, 'The entered input is: $' ; Newline and display message
input_buffer DB 10, 0   ; Buffer to store input: 10 max chars, initial count 0
                        ; The actual characters will be stored starting here
                        ; Followed by a terminator (CR)
END         ; End of program
```

Output:





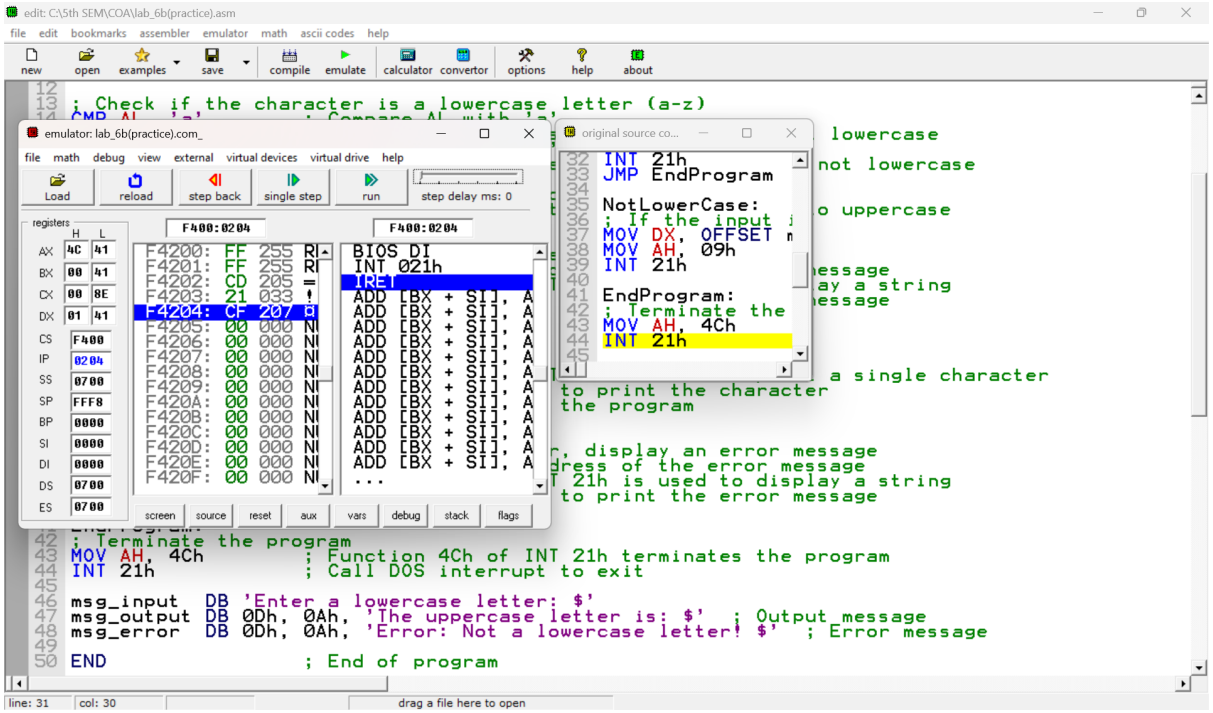
(b) Write an assembly language program to convert a lower-case letter to the corresponding upper-case letter.

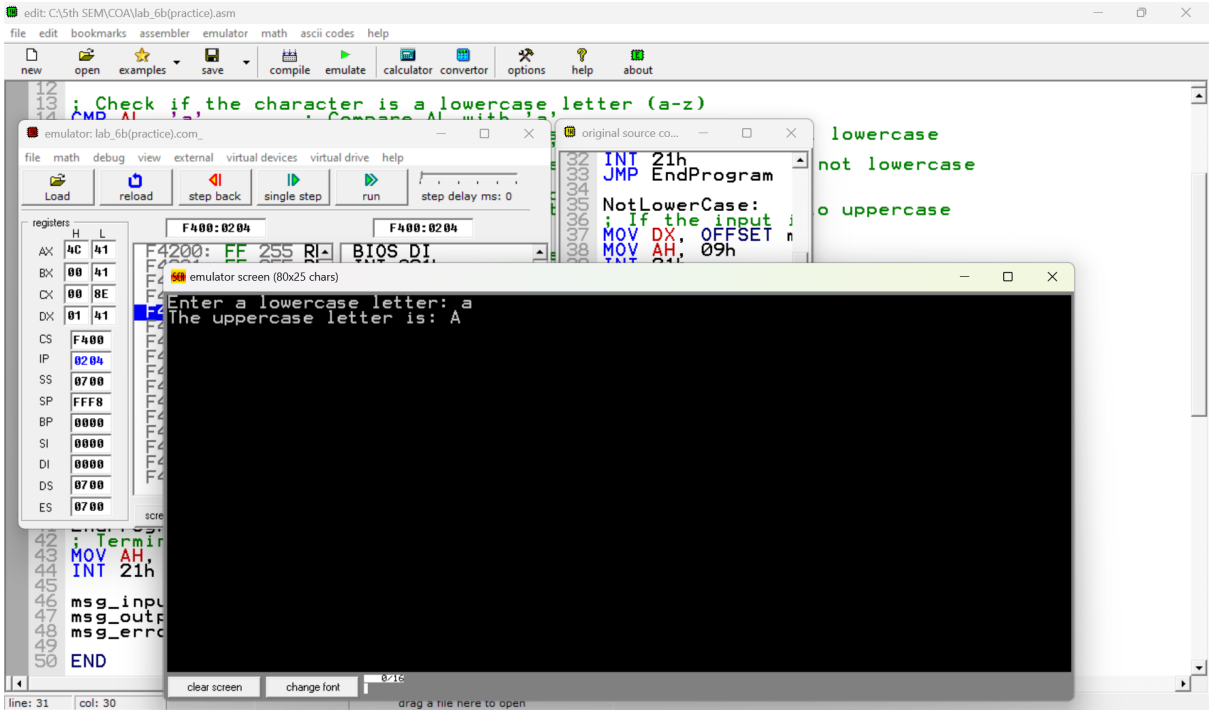
Code:

```
ORG 100h          ; Origin, to specify that the program starts at 100h (COM file format)
; Display message "Enter a lowercase letter: "
MOV DX, OFFSET msg_input  ; Load the address of the message
MOV AH, 09h       ; Function 09h of INT 21h is used to display a string
INT 21h           ; Call DOS interrupt to print the message
; Read a single character from the user
MOV AH, 01h       ; Function 01h of INT 21h is used to read a character
INT 21h           ; Call DOS interrupt to get the character
MOV DL, AL        ; Store the input character in AL
; Check if the character is a lowercase letter (a-z)
CMP AL, 'a'       ; Compare AL with 'a'
JL NotLowerCase   ; If the input is less than 'a', it is not lowercase
CMP AL, 'z'       ; Compare AL with 'z'
JG NotLowerCase   ; If the input is greater than 'z', it is not lowercase
```

```
; Convert the lowercase letter to uppercase
SUB AL, 20h       ; Subtract 32 (20h) to convert lowercase to uppercase
MOV BL,AL
; Print the message "The uppercase letter is: "
MOV DX, OFFSET msg_output  ; Load the address of the output message
MOV AH, 09h       ; Function 09h of INT 21h is used to display a string
INT 21h           ; Call DOS interrupt to print the output message
MOV AL, BL
; Print the converted uppercase letter
MOV DL, AL        ; Move the uppercase letter to DL
MOV AH, 02h       ; Function 02h of INT 21h is used to print a single character
INT 21h           ; Call DOS interrupt to print the character
JMP EndProgram    ; Jump to the end of the program
NotLowerCase:
; If the input is not a lowercase letter, display an error message
MOV DX, OFFSET msg_error  ; Load the address of the error message
MOV AH, 09h       ; Function 09h of INT 21h is used to display a string
INT 21h           ; Call DOS interrupt to print the error message
EndProgram:
; Terminate the program
MOV AH, 4Ch       ; Function 4Ch of INT 21h terminates the program
INT 21h           ; Call DOS interrupt to exit
msg_input  DB 'Enter a lowercase letter: $'
msg_output DB 0Dh, 0Ah, 'The uppercase letter is: $'  ; Output message
msg_error  DB 0Dh, 0Ah, 'Error: Not a lowercase letter! $'  ; Error message
END               ; End of program
```

OUTPUT:


edit: C:\5th SEM\COA\lab_6b(practice).asm
emulator: lab_6b(practice).com_
original source co...
; Check if the character is a lowercase letter (a-z)
MOV AH, 4Ch ; Function 4Ch of INT 21h terminates the program
INT 21h ; Call DOS interrupt to exit
msg_input DB 'Enter a lowercase letter: $'
msg_output DB 0Dh, 0Ah, 'The uppercase letter is: $' ; Output message
msg_error DB 0Dh, 0Ah, 'Error: Not a lowercase letter! $' ; Error message
END ; End of program


edit: C:\5th SEM\COA\lab_6b(practice).asm
emulator: lab_6b(practice).com_
original source co...
emulator screen (80x25 chars)
Enter a lowercase letter: a
The uppercase letter is: A
clear screen
change font