HACETTEPE UNIVERSITY

ELECTRICAL AND ELECTRONICS ENGINEERING

ELE338 MICROPROCESSOR ARCHITECTURE AND PROGRAMMING LAB.

PRELIMINARY WORK 2
MEMORY AND VARİABLE OPERATIONS
2020-2021 SPRING

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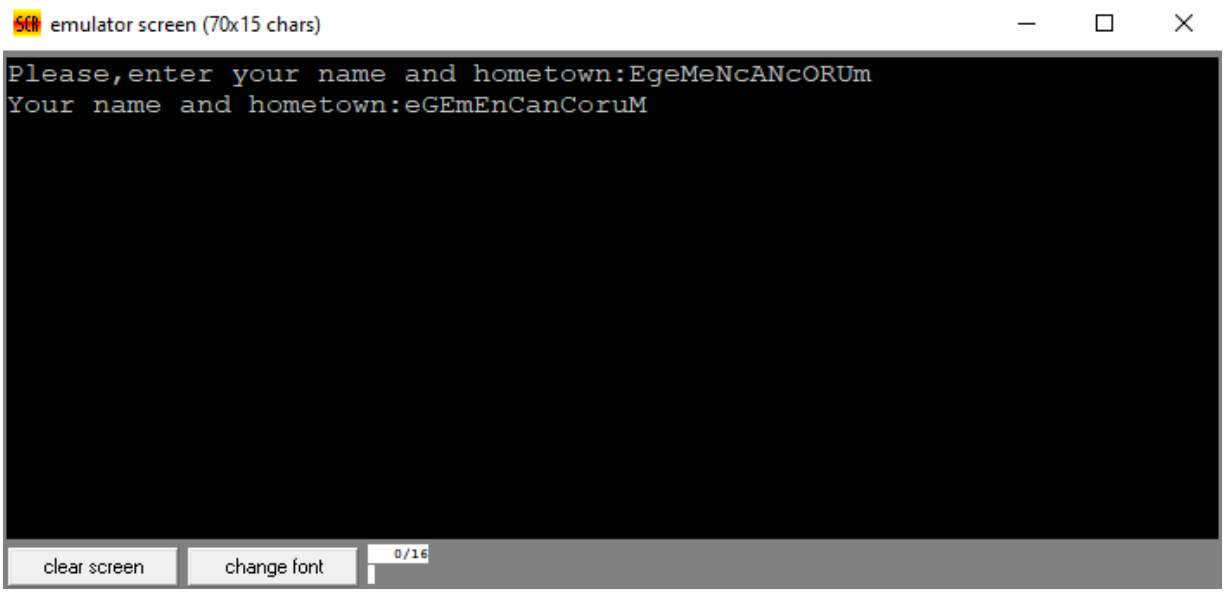
1. Question

EMU8086 CODE

```
Org 100h

 MOV AH,09h
 MOV DX,OFFSET InputStrıng        ;To show what ı have to do
 INT 21H

 LEA BX,InData                    ;To put value to the empty register
 LEA BP,OutData                   ;InData and OutData hold values

TRY:
 MOV AH,01h                       ;To give input to the screen.
 INT 21h
                                  ;Values are stored in AL
 MOV [BX],AL                      ;I put the values on [BX]
 MOV CX,[BX]                      ;To do the substraction
 CMP AL,0Dh                       ;If value is enter button,ZF = 1
 JE FINISH                        ;If ZF=1,Je command jump to FINISH.

 SUB CX,91                        ;To find out what the value is
 JB UppertoLower                  ;If value is big word,CF=1
 JNC LowertoUpper                 ;If value is small word,CF=0

UppertoLower:                    ;The reason for this section is to spin the word.
 ADD [BX],32        ;In ASCII Table,the difference between lowercase and uppercase is 32d.
 MOV DI,[BX]                      ;IF I add 32d in the uppercase, it turns to lowercase.
 MOV [BP],DI                      ;I stored the value in [BP]
 MOV DI,0                         ;After the turning,DI must be 0 again.
 INC BP                           ;To pass next word.
 JMP TRY

LowertoUpper:
 SUB [BX],32                      ;IF I sub 32d in the lowercase, it turns to uppercase.
 MOV DI,[BX]
 MOV [BP],DI                      ;I stored the value in [BP]
 MOV DI,0                         ;After the turning,DI must be 0 again.
 INC BP                           ;To pass next word.
 JMP TRY

FINISH:
 MOV AH,09h
 MOV DX,OFFSET NextRow            ;To pass the next row
 INT 21H

 MOV AL,'$'
 MOV [BP],AL

 MOV AH,09h
 MOV DX,OFFSET OutputStrıng
 INT 21H

 MOV AH,09h
 MOV DX,OFFSET OutData            ;To show my OutData
 INT 21H

Ret
 InputStrıng DB 'Please,enter your ınput data:','$'
 OutputStrıng DB 'Your output data is:','$'
 InData DB 15 dup(?)                              ;My Input Data
 OutData DB 15 dup(?)                             ;My Output Data
 NextRow DB 0Ah,0DH,'$'                           ;To pass the next row
End
```

RESULTS



COMMENT

At the beginning of the code, I print what I want on the screen. After that, I put my memory blocks addresses, which I allocated for input and output, to the BX and BP Register with the LEA command. I enter my input value.Then, the value I have entered are stored in the AL Register. Checking if my entry has an enter key. If it is not enter, I subtract the letter I entered from 91d to find if it is an upper or lower case. If uppercase, it becomes CF=1 and the code jumps to UppertoLower position thanks to JB Command. If lowercase, it becomes CF=0 and the code jumps to LowertoUpper position thanks to JNC Command.

In this code, I used the differences between uppercase and lowercase being 32d according to ASCII. If the letter is upper, ı add 32d on the letter. If the letter is lower, ı substract 32d on the letter. Then, ı convert the letter. This process is done for each letter. And if ı enter the enter button,the codes jumps to FINISH position. And my output values are printed in the screen.

2. Question

EMU8086 CODE

```
Org 100h

 MOV AH,09h
 MOV DX,OFFSET Somewords        ;To show my InData.
 INT 21h

 MOV AH,09h
 MOV DX,OFFSET NextRow          ;To pass the next row.
 INT 21H

 LEA BX,Somewords               ;I stored ınput memory location in the BX Register.
 SUB [BX],32d                   ;First turning operation.
 INC BX                         ;To the next word.

TRY:
 MOV AL,[BX]                    ;The word is in the AL Register.
 CMP AL,36d                     ;Compare the word as a $ sign?
 JE FINISH          ;If word is $ sign,ZF will be 1 and the code will jump to the FINISH.
 CMP AL,32d                     ;Compare the word as a space button?
 JE Upper           ;If word is SPACE,ZF will be 1 and the code will jump to the Upper.
 INC BX                         ;Otherwise, Increase the BX and Turn the TRY.
 JMP TRY

Upper:
 SUB [BX+1],32d                 ;If the word is space,the next word will be Uppercase.
 INC BX                         ;Increase the BX and Turn the TRY.
 JMP TRY

FINISH:
 MOV AH,09h
 MOV DX,OFFSET Somewords        ;To show OutData.
 INT 21H

Ret
 Somewords DB 'btjs are current controlled devices.','$'
 NextRow DB 0Ah,0DH,'$'
End
```

RESULTS

COMMENT

Firstly, First, I show my input value on my screen. After that, I pass the next row. I put my memory blocks addresses, which I allocated for input,to the BX Register with the LEA command.

Before the loop, I change the first letter from lowercase to uppercase. Then, I enter the TRY loop. I put the letter in AL Register and compare the letter with 36d($ sign). If it is not equal to the $ sign, it compare again with the 32d(space button). If it is not equal to the space button. The code jumps to TRY position. My code jumps to UPPER in every space button in my input. After that, after each jump, I change the first letter from lowercase to uppercase and ı returned to the TRY position again.

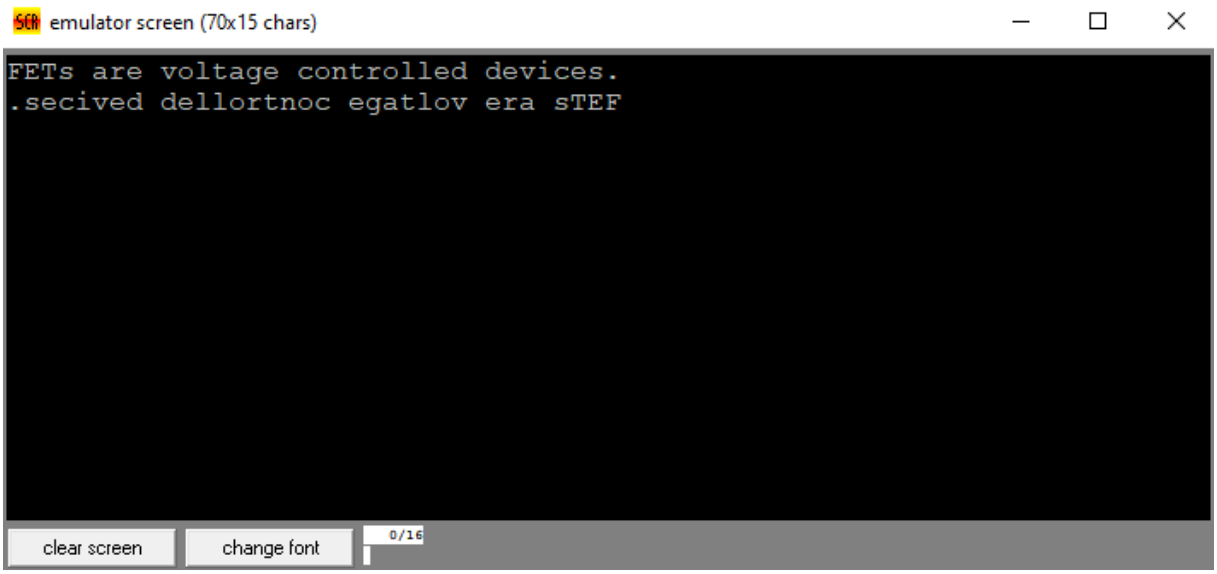
If my letter is $ sign, the code jumps to FINISH position thanks to JE Command and the code shows output on the screen and the code ends.

3. Question

EMU8086 CODE

```
Org 100h

 LEA BP,Somewords       ;To put the Input Data
 MOV DI,0h

HMTURN:                 ;HMTURN shows how many caharacter in input data
 MOV AL,[BP+DI]
 INC DI                 ;MY Counter
 CMP AL,36d             ;If the word is $ sign,the counter ends.
 JNE HMTURN
 MOV AL,0h              ;Reset the AL Register
 DEC DI                 ;Decreament reason is the $ sign.
 MOV CX,DI              ;My second counter to show the output data

READ:
 MOV AL,[BP]            ;Word is stored in AL Register.
 PUSH AX                ;The word is being held.
 INC BP                 ;To pass other word.
 MOV AH,0Eh
 INT 10h                ;To show input data in my screen.
 MOV AH,0h              ;AH is reset because we show the word at AX.
 DEC CX                 ;If CX=0, The loop ends.
 JNZ READ

 MOV AH,09h
 MOV DX,OFFSET NextRow   ;To pass next row.
 INT 21h

WRITE:                   ;My output LOOP
 MOV AH,0h
 POP AX                 ;To print the held values.
 MOV [BP+DI],AL
 MOV AH,0Eh             ;To show output data in my screen.
 INT 10h
 DEC DI                 ;If DI=0, The loop ends.
 JNZ WRITE

RET
 Somewords DB 'FETs are voltage controlled devices.','$'
 NextRow DB 0Ah,0Dh,'$'
End
```

RESULTS



COMMENT

I put my memory blocks addresses, which I allocated for input,to the BX Register with the LEA command. I used DI to find out how many characters are in the input. So DI is my counter. In first loop, when the letter is $ sign, the code does not jumps to HWTURN position. Also, ı find the DI. It is necessary to subtract one from DI because DI counts the $ sign.

The reason of READ position is holding the letter with the PUSH Command in the Register and shows input on the screen. PUSH Command holds the letter one by one. When the counter is zero, it jumps to other position.

In the WRİTE position, Until,counter is 0, the words captured by the PUSH Command are printed with the POP Command and shows output on the screen.