"ASSEMBLY LAB ASSIGNMENT"

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Write an assembly language program to implement a case conversion program that will read a string (a line of characters of letters, digits, punctuation symbols, and others) as input and then convert the letters into its opposite case as output. Here, the characters which are not belonged to letters will remain be unchanged. Your program must contain necessary messages for formatted input and output.

```
MODEL SMALL
.STACK 100H
.DATA
    MSG  DB  0DH,0AH, ' Enter a String:  $'
    MSG2 DB  0DH,0AH, ' Converted string is:  $'
    STR1 DB  255 DUP(?)

.CODE

    MAIN PROC
            MOV AX,@DATA
            MOV DS,AX

            LEA DX,MSG
            MOV AH,09H
            INT 21H

            LEA SI,STR1
            MOV AH,01H

        READ:
            INT 21H

            CMP AL,0DH
            JE  DISPLAY

            CMP AL,65
            JGE CHECK

            CMP AL,97
            JGE CHECK2

            JMP NC

        NC:
            MOV [SI],AL

            INC SI
            JMP READ

        CHECK:
            CMP AL,90
            JLE CHANGE

        CHECK2:
            CMP AL,122
            JLE CHANGE

        CHANGE:
            XOR AL,20H
            MOV [SI],AL
            INC SI

            JMP READ

        DISPLAY:

            MOV AL,'$'
            MOV [SI],AL

            LEA DX,MSG2
            MOV AH,09H
            INT 21H

            LEA DX,STR1
            MOV AH,09H
            INT 21H

            MOV AH,4CH
            INT 21H
    MAIN ENDP
END MAIN
```

Write an assembly language program to implement a string reversal program that will read a string (a line of characters of letters, digits, punctuation symbols, and others) as input and then make the reverse form of the string as output. You have to solve this problem in two ways such as (i) using array (ii) using stack. Your program must contain necessary messages for formatted input and output.

```
.MODEL SMALL
.STACK 100H
.DATA
    MSG1 DB 0DH,0AH, 'INPUT STRING: $'
    MSG2 DB 0DH,0AH, 'REVERSE STRING: $'
.CODE
    MAIN PROC
            MOV CX,0
            MOV AX,@DATA
            MOV DS,AX

            LEA DX,MSG1
            MOV AH,9
            INT 21H

        INPUT:
            MOV AH,1
            INT 21H

            CMP AL,0DH
            JE LINE

            AND DX,0
            MOV DL,AL
            PUSH DX
            INC CX
            JMP INPUT

        LINE:
            MOV DX,0DH
            MOV AH,2
            INT 21H
            MOV DX,0AH
            MOV AH,2
            INT 21H

            LEA DX,MSG2
            MOV AH,9
            INT 21H

        PRINT:
            AND DX,0
            POP DX
            MOV AH,2
            INT 21H
            LOOP PRINT

            MOV AH,4CH
            INT 21H
            MAIN ENDP
    END MAIN
```

```
.MODEL SMALL
.STACK 100H
.DATA
    MSG1 DB 'INPUT: $'
    MSG2 DB 0DH,0AH,'Vowel:$'
    MSG3 DB 0DH,0AH,'Consonants:$'
    MSG4 DB 0DH,0AH,'Digits:$'
    MSG5 DB 0DH,0AH,'Spaces:$'
.CODE
    MAIN PROC
        AND CH,0
        AND BH,0
        AND BL,0
        AND CL,0

        MOV AX,@DATA
        MOV DS,AX

        LEA DX,MSG1
        MOV AH,9
        INT 21H

        MOV AH,1
    READ:
        INT 21H
        CMP AL,0DH
        JE PRINT

        CMP AL,32
        JE COUNTSPACES

        CMP AL,0
        JE COUNTDIGITS
        CMP AL,1
        JE COUNTDIGITS
        CMP AL,2
        JE COUNTDIGITS
        CMP AL,3
        JE COUNTDIGITS
        CMP AL,4
        JE COUNTDIGITS
        CMP AL,5
        JE COUNTDIGITS
        CMP AL,6
        JE COUNTDIGITS
        CMP AL,7
        JE COUNTDIGITS
        CMP AL,8
        JE COUNTDIGITS
        CMP AL,9
        JE COUNTDIGITS

        CMP AL,'a'
        JE COUNTVOWELS
        CMP AL,'A'
        JE COUNTVOWELS
        CMP AL,'E'
        JE COUNTVOWELS
        CMP AL,'e'
        JE COUNTVOWELS
        CMP AL,'I'
        JE COUNTVOWELS

        CMP AL,'i'
        JE COUNTVOWELS
        CMP AL,'O'
        JE COUNTVOWELS
        CMP AL,'o'
        JE COUNTVOWELS
        CMP AL,'U'
        JE COUNTVOWELS
        CMP AL,'u'
        JE COUNTVOWELS

        CMP AL,'B'
        JE COUNTCONSONENTS
        CMP AL,'b'
        JE COUNTCONSONENTS
        CMP AL,'C'
        JE COUNTCONSONENTS
        CMP AL,'c'
        JE COUNTCONSONENTS
        CMP AL,'D'
        JE COUNTCONSONENTS
        CMP AL,'d'
        JE COUNTCONSONENTS
        CMP AL,'F'
        JE COUNTCONSONENTS
        CMP AL,'f'
        JE COUNTCONSONENTS
        CMP AL,'G'
        JE COUNTCONSONENTS
        CMP AL,'g'
        JE COUNTCONSONENTS
        CMP AL,'H'
        JE COUNTCONSONENTS
        CMP AL,'h'
        JE COUNTCONSONENTS
        CMP AL,'J'
        JE COUNTCONSONENTS
        CMP AL,'j'
        JE COUNTCONSONENTS
        CMP AL,'K'
        JE COUNTCONSONENTS
        CMP AL,'k'
        JE COUNTCONSONENTS
        CMP AL,'L'
        JE COUNTCONSONENTS
        CMP AL,'l'
        JE COUNTCONSONENTS
        CMP AL,'M'
        JE COUNTCONSONENTS
        CMP AL,'m'
        JE COUNTCONSONENTS
        CMP AL,'N'
        JE COUNTCONSONENTS
        CMP AL,'n'
        JE COUNTCONSONENTS
        CMP AL,'P'
        JE COUNTCONSONENTS
        CMP AL,'p'
        JE COUNTCONSONENTS
        CMP AL,'Q'
        JE COUNTCONSONENTS
        CMP AL,'q'
```

```
        JE COUNTCONSONENTS                      COUNTVOWELS:
        CMP AL,'R'                                  MOV DL,BL
        JE COUNTCONSONENTS                          INC DL
        CMP AL,'r'                                  MOV BL,DL
        JE COUNTCONSONENTS                          JMP READ
        CMP AL,'S'
        JE COUNTCONSONENTS                      COUNTCONSONENTS:
        CMP AL,'s'                                  MOV DL,CL
        JE COUNTCONSONENTS                          INC DL
        CMP AL,'T'                                  MOV CL,DL
        JE COUNTCONSONENTS                          JMP READ
        CMP AL,'t'
        JE COUNTCONSONENTS                      PRINT:
        CMP AL,'V'                                  LEA DX,MSG5
        JE COUNTCONSONENTS                          MOV AH,9
        CMP AL,'v'                                  INT 21H
        JE COUNTCONSONENTS                          MOV DL,BH
        CMP AL,'W'                                  MOV AH,2
        JE COUNTCONSONENTS                          INT 21H
        CMP AL,'w'
        JE COUNTCONSONENTS                          LEA DX,MSG4
        CMP AL,'X'                                  MOV AH,9
        JE COUNTCONSONENTS                          INT 21H
        CMP AL,'x'                                  MOV DL,CH
        JE COUNTCONSONENTS                          MOV AH,2
        CMP AL,'Y'                                  INT 21H
        JE COUNTCONSONENTS
        CMP AL,'y'                                  LEA DX,MSG2
        JE COUNTCONSONENTS                          MOV AH,9
        CMP AL,'Z'                                  INT 21H
        JE COUNTCONSONENTS                          MOV DL,BL
        CMP AL,'z'                                  MOV AH,2
        JMP READ                                    INT 21H

    COUNTSPACES:                                    LEA DX,MSG3
        MOV DL,BH                                   MOV AH,9
        INC DL                                      INT 21H
        MOV BH,DL                                   MOV DL,CL
        JMP READ                                    MOV AH,2
COUNTDIGITS:                                        INT 21H
        MOV DL,CH
        INC DL                                      MOV AH,4CH
        MOV CH,DL                                   INT 21H
        JMP READ
                                                    MAIN ENDP
                                            END MAIN
```