

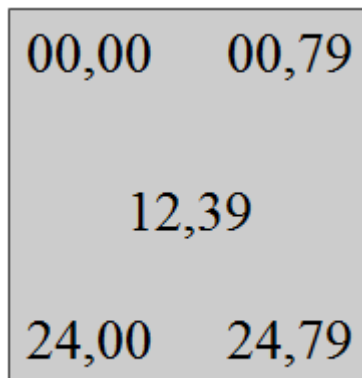
## CS222- Lab 6

### Assembly language Programming

The goal of this is to familiarize the students with 8086 assembly language features.

#### INT 10 /INT 21

- INT 10H subroutines are used to communicate with the computer's screen video.



#### Cursor Locations

- INT 10H Function 06
  - AL = number of lines to scroll (with AL=00, window will be cleared)
  - BH = attribute of blank rows
  - CH, CL = upper row, left column
  - DH, DL = lower row, right column
- INT 10H function 02; setting the cursor to a specific location
  - Function AH = 02 will change the position of the cursor to any location.
  - The desired cursor location is in DH = row, DL = column

#### P1:

Write a program that clears the screen and sets the cursor at the center of the screen

**; clearing the screen**

```
MOV AX, 0600H    ;scroll the entire page
MOV BH, 07       ; normal attribute (white on black)
MOV CX, 0000     ; upper left
MOV DX, 184FH    ; lower right
INT 10H
```

**;setting the cursor at the center**

```
MOV AH, 02 ; set cursor option
MOV BH, 00 ; page 0
```

```
MOV DL, 39 ;
MOV DH, 12 ;
INT 10H
```

- **INT 10H function 03; get current cursor position**

```
MOV AH, 03
MOV BH, 00
INT 10H
```

Test Different examples

**Ans here:**

P2:

- **INT 21H is provided by DOS to be invoked to perform extremely useful functions.**
- **INT 21H Option 09: Outputting a string of data to the monitor**
  - **INT 21H can be used to send a set of ASCII data to the monitor.**
  - **AH = 09; DX = offset address of the ASCII data to be displayed.**
  - **INT 21H option 09 will display the ASCII data string pointed to by DX until it encounters the dollar sign “\$”.**

A11 DB ‘ India is my country’,’\$’

```
lea DX, msg
MOV AH,09
INT 21H
```

Test Different examples

**Ans here:**

P3:

- **INT 21H Option 02: Outputting a single character to the monitor**
  - **DL is loaded with the character first**

```
MOV AH,02
Mov dl,'j'
INT 21H
```

Test Different examples

**Ans here:**

P4:

Study the following ALP for:

- Clear the screen
- Set the cursor to the center
- Display the message “This is a test of the display routine”

```
.MODEL SMALL
.STACK 64
;-----
.DATA
MESSAGE DB      'This is a test of the display routine','$'
;-----
.CODE
MAIN      PROC  FAR
    MOV     AX,@DATA
    MOV     DS,AX
    CALL    CLEAR      ;CLEAR THE SCREEN
    CALL    CURSOR      ;SET CURSOR POSITION
    CALL    DISPLAY     ;DISPLAY MESSAGE
    MOV     AH,4CH
    INT     21H         ;GO BACK TO DOS
    MAIN    ENDP
;THIS SUBROUTINE CLEARS THE SCREEN
CLEAR PROC
    MOV     AX,0600H    ;SCROLL SCREEN FUNCTION
    MOV     BH,07       ;NORMAL ATTRIBUTE
    MOV     CX,0000     ;SCROLL FROM ROW=00,COL=00
    MOV     DX,184FH    ;TO ROW=18H,COL=4FH
    INT     10H         ;INVOKE INTERRUPT TO CLEAR SCREEN
    RET
    CLEAR   ENDP
;THIS SUBROUTINE SETS THE CURSOR AT THE CENTER OF THE SCREEN
CURSOR PROC
    MOV     AH,02       ;SET CURSOR FUNCTION
    MOV     BH,00       ;PAGE 00
    MOV     DH,12       ;CENTER ROW
    MOV     DL,39       ;CENTER COLUMN
    INT     10H         ;INVOKE INTERRUPT TO SET CURSOR POSITION
    RET
```

```

        CURSOR ENDP
;THIS SUBROUTINE DISPLAYS A STRING ON THE SCREEN
        DISPLAY PROC
        MOV  AH,09          ;DISPLAY FUNCTION
        MOV  DX,OFFSET MESSAGE ;DX POINTS TO OUTPUT BUFFER
        INT  21H           ;INVOKE INTERRUPT TO DISPLAY STRING
        RET
        DISPLAY ENDP
        END  MAIN

```

**Your task:**

Write ALP to performs the following, (1) clears the screen, (2) sets the cursor at the beginning ;of the third line from the top of the screen, (3) accepts the message "IBM perSonal ;Computer" from the keyboard, (4) converts lowercase letters of the message to uppercase, ; (5) displays the converted ;results on the next line.

**ANS Here:**

```

.model small
.stack 64
.data

a1 DB 'H', 'e', 'l', 'l', 'o'
a2 dw 111h, 222h, 333h, 444h, 555h
.code

start: mov ax,@data
        mov ds,ax
        LEA SI, a1
        MOV CX, 5
        MOV AH, 0Eh
m: LODSB
    INT 10h
    LOOP m
;Load word at DS:[SI] into AX
    LEA SI, a2
    MOV CX, 5
    REP LODSW
    mov ah,4ch
    int 21h
end

```

**P5:**  
**String Instructions**

Load byte at DS:[SI] into AL. Update SI.

Algorithm:

AL = DS:[SI]

if DF = 0 then

SI = SI + 1

else

SI = SI - 1

**Example**

a1 DB 'H', 'e', 'l', 'l', 'o'

LEA SI, a1

MOV CX, 5

MOV AH, 0Eh

m: LODSB

INT 10h

LOOP m

**Your task:**

Load word at DS:[SI] into AX. Update SI.

**Your Answer Here:**

**P6:**

Copy byte at DS:[SI] to ES:[DI]. Update SI and DI.

Algorithm:

ES:[DI] = DS:[SI]

if DF = 0 then

SI = SI + 1

DI = DI + 1

else

SI = SI - 1

DI = DI - 1

### Example

a1 DB 1,2,3,4,5

a2 DB 5 DUP(0)

LEA SI, a1

LEA DI, a2

MOV CX, 5

REP MOVSB

### Your task

Copy **word** at DS:[SI] to ES:[DI]. Update SI and DI.

Answer Here:

P7:

PUSH 1 general purpose registers DI, SI, BP to stack and pop BX, DX, CX, AX from the stack.

POP DI

POP SI  
POP BP  
  
POP BX  
POP DX  
POP CX  
POP AX

**Your task**

Push all general purpose registers AX, CX, DX, BX, SP, BP, SI, DI in the stack

Pop to different register and verify the operation.

**Answer Here:**

**P8:**

Compare String: Study the following sample program

```
.model small
.stack 64
.data

STR1 DB "ENTER FIRST STRING HERE ->$"
STR2 DB "ENTER SECOND STRING HERE ->$"
STR11 DB "FIRST STRING : ->$"
STR22 DB "SECOND STRING: ->$"

INSTR1 DB 20 DUP("$")
INSTR2 DB 20 DUP("$")
NEWLINE DB 10,13,"$"
N DB ?
S DB ?
MSG1 DB "BOTH STRING ARE SAME$"
MSG2 DB "BOTH STRING ARE DIFFERENT$"
```

.code

START: MOV AX,@DATA  
MOV DS,AX

LEA SI,INSTR1  
LEA DI,INSTR2

;GET STRING  
MOV AH,09H  
LEA DX,STR1  
INT 21H

MOV AH,0AH  
MOV DX,SI  
INT 21H

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

MOV AH,09H  
LEA DX,STR2  
INT 21H

MOV AH,0AH  
MOV DX,DI  
INT 21H

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

;PRINT THE STRING



```
MOV AH,09H
LEA DX,STR11
INT 21H
```

```
MOV AH,09H
LEA DX,INSTR1+2
INT 21H
```

```
MOV AH,09H
LEA DX,NEWLINE
INT 21H
```

```
MOV AH,09H
LEA DX,STR22
INT 21H
```

```
MOV AH,09H
LEA DX,INSTR2+2
INT 21H
```

```
MOV AH,09H
LEA DX,NEWLINE
INT 21H
```

```
;STRING COMPARISION
MOV BX,00
```

```
MOV BL,INSTR1+1
MOV BH,INSTR2+1
```

```
CMP BL,BH
JNE L1
```

```
ADD SI,2
ADD DI,2
```

```
L2:MOV BL,BYTE PTR[SI]
```

```
CMP BYTE PTR[DI],BL
JNE L1
INC SI
INC DI
CMP BYTE PTR[DI],"$"
JNE L2
```

```
MOV AH,09H
LEA DX,MSG1
INT 21H
```

```
JMP L5
```

```
L1:MOV AH,09H
LEA DX,MSG2
INT 21H
```

```
L5:
MOV AH,09H
LEA DX,NEWLINE
INT 21H
```

```
MOV AH,4CH
INT 21H
```

```
END START
```

**Modify the program to report the position of the difference.**

**Your Answer Here:**

**P9:**

Store byte in AL into ES:[DI]. Update DI.

Example:

.data

a1 DW 5 dup(0)

LEA DI, a1

MOV AL, 12h

MOV CX, 5

REP STOSB

Write an ALO t Store word in AX into ES:[DI]. Update DI.

**Your Ans Here**

**Submission :**

Submit single doc/pdf file with above answers. Course work submission through [cs322.iitp@gmail.com](mailto:cs322.iitp@gmail.com) with subject: YourrollNo\_Lab4. **Due on 14<sup>th</sup> September 2018 , 5PM.**