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FACULTY OF INFORMATION TECHNOLOGY

Computer Organization and Assembly Language

Lab 11

Topic 1. String Operations

PART 1

String Instructions

Instruction	Functionality actually performed	
movsb	1. Mov [ES:DI],[DS:SI] 2. Inc si 3. Inc di	Invalid instruction (memory to memory)
movsw	1. Mov [ES:DI],[DS:SI] 2. Add si,2 3. Add di,2	Invalid instruction (memory to memory)
scasb	1. Cmp al,[ES:DI];ZF=1 if same 2. Inc DI	
scasw	1. Cmp ax,[DI];ZF=1 if same 2. Add DI,2	
cmps	1. Cmp [DS:SI],[ES:DI];ZF=1 if same 2. Inc SI 3. Inc DI	Invalid instruction (memory to memory)
cmpsw	1. Cmp [DS:SI],[ES:DI];ZF=1 if same 2. Add si,2 3. Add di,2	Invalid instruction (memory to memory)
lods	1. Mov al,[DS:SI] 2. Inc si	
lodsw	1. Mov ax,[DS:SI] 2. Add si,2	
stos	1. Mov [ES:DI],al 2. Inc di	
stosw	1. Mov [ES:DI],ax 2. Add di,2	
Rep	It repeats the instruction cx times.	
Repe	It executes the instruction cx times or until zf remains 1.	
Repne	It executes the instruction cx times or exit when zf becomes 1.	



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Note: All yellow highlighted instructions will depend upon direction flag(cld, std) see second last example.

String Examples

Simple String(Example)

```
jmp start
data1 db "Hello,World",0
data2: times 20 db 0
start:
mov si, data1
mov di, data2
mov cx, 11
l1:
mov al, [si]
mov [di], al
inc si
inc di
loop l1
mov ax, 0x4c00
int 21h
```

movsb(Example)

```
[org 0x100]
jmp start
data1 db "Hello,World",0
data2: times 20 db 0
start:
mov si, data1
mov di, data2
mov cx, 11
l1:
movsb
loop l1
mov ax, 0x4c00
int 21h
```



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Using loop instruction(Example)

```
[org 0x100]
jmp start
data1 db "Hello,World",0
data2: times 20 db 0
start:
mov si, data1
mov di, data2
mov cx, 11
l1:
movsb
loop l1
mov ax, 0x4c00
int 21h
```

Using REP instruction(Example)

```
[org 0x100]
jmp start
data1 db "Hello,World",0;
data2: times 100 db 0
start:
mov si, data1
mov di, data2
mov cx, 11
REP MOVSB
mov ax, 0x4c00
int 21h
```



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Using SCAS instruction(Example)

```
[org 0x100]
jmp start
STR1 db 'HelloBoys',0
start:
mov di, STR1;
MOV AL, 'B';
MOV CX, 9;
REPE SCASB
;this code runs till
;zf remain 1.
;keep in mind the functionality
;of rep and repe is different
```

Using CMPS instruction(Example)

```
[org 0x100]
jmp start
STR1 db 'comiputer',0
STR2 db 'computer',0
start:
mov di, STR1;
mov si, STR2;
MOV CX, 8;
REPE CMPSB
;this code runs till
;comparison between
;two strings is giving zf=1.
;keep in mind the
;functionality of rep
;and repe is different
```



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Using LODSB instruction(Example)

```
[org 0x100]
jmp start
STR1 db 'IamUCPIAN',0
STR2 db 'IamUCPIAN',0
count db 0
start:
mov di, STR1
Mov si, STR2
MOV CX, 9
L1:
LODSB
SCASB
je L2
jne L3
L2:
inc byte [count]
L3:
loop L1
mov ax, 0x4c00
int 21h
;calculating how
;many characters same.
```

Using STOSB instruction(Example)

```
[org 0x100]
jmp start
STR1 db 'UCPIANS',0
STR2 times 8 db 0
start:
Mov si, STR1;
Mov di, STR2;
MOV CX, 7;
L1:
LODSB
STOSB

loop L1
;making copy of a string.
```



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Traversing array from left to right

```
[org 0x100]
mov si,array1
mov cx,16
cld      ;reset the direction flag
;increments the si
;and di in string operations
rep lodsb

mov ax,0x4c00
int 21h
array1 db 'I am Study COAL.'
```

Traversing array from right to left

```
[org 0x100]
mov si,array1
mov cx,16
add si,15;to get the address of
;last character in the string.
std      ;set direction flag
;decrements the si
;and di in string operations
rep lodsb
mov ax,0x4c00
int 21h
array1 db 'I am Study COAL.'
```



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Using string operations with video memory.

```
[org 0x100]
jmp start
data1 db "HELLOUCPIAN";
data2: times 11 db 0
start:
mov si, data1
mov di, data2
mov cx, 11
l1:
movsb
loop l1
mov cx, 21
mov ax, 0xb800
mov es, ax
mov si, data1
mov di, 0
mov ah, 0x3f
label1:
    lodsb
    stosw
    loop label1
mov ax, 0x4c00
int 21h
```



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Practice Tasks

Problem #1:

Write a program that will print "Hello world" on screen using string instruction.

Example:

HelloWorld HelloWorld HelloWorld HelloWorld HelloWorld HelloWorld HelloWorld
HelloWorld HelloWorld HelloWorld HelloWorld HelloWorld HelloWorld HelloWorld
HelloWorld HelloWorld HelloWorld HelloWorld HelloWorld HelloWorld HelloWorld
HelloWorld HelloWorld HelloWorld HelloWorld HelloWorld HelloWorld HelloWorld
HelloWorld HelloWorld HelloWorld HelloWorld

Problem #2:

Write an assembly language program to display triangle of * on the screen as follows. Use loops to calculate the next screen location to display the next character. Use only string instruction.

i.e

if user give 5

```
*  
**  
***  
****  
*****
```

If user give 3

```
*  
**  
***
```

Problem #3:

Write an assembly language program to display triangle of * on the screen as follows. Use loops to calculate the next screen location to display the next character. Use only string instruction.



if user give 4

If user give 2

Problem #4:

Example:

[illegible]



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Problem #5:

Write a subroutine which calculates the

- a) *The total size of string including space character.*
- b) *Total size of string without spaces*

Use only string instruction.

Problem # 6:

Write a subroutine which checks whether the string is a **palindrome** or not.

If it is then display string 'It is a palindrome'

else

Display 'It is not a palindrome'

Hint: use cld, std, lodsb, scasd and loop instruction