



# University of Central Punjab

(Incorporated by Ordinance No. XXIV of 2002 promulgated by Government of the Punjab)

FACULTY OF INFORMATION TECHNOLOGY

## Computer Organization and Assembly Language

### Lab 12

Topic 1. String operations

### PART 1

#### String Instructions

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

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



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## String Examples

### Simple String(Example)

### movsb(Example)

```
[org 0x100]
jmp start

data1 db 'Abcd,edfg,ijkl,mnopqr',0
data2: times 30 db 0

start:
mov si, data1
mov di, data2
mov cx, 21

l1:
mov al, [si]
mov [di], al
inc si
inc di
loop l1

mov ax,0x4c00
int 21h
```

```
[org 0x100]
jmp start
data1 db 'Abcd,edfg,ijkl,mnopqr',0
data2: times 30 db 0
start:
mov si, data1
mov di, data2
mov cx, 21

l1:

movsb

loop l1

mov ax,0x4c00
int 21h
```



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## Using loop instruction(Example)

## Using REP instruction(Example)

```
[org 0x100]
jmp start
data1 db 'Abcd,edfg,ijkl,mnopqr',0;
data2: times 100 db 0
```

```
start:
mov si, data1
mov di, data2
mov cx, 21
l1:
movsb
loop l1
```

```
mov ax,0x4c00
```

```
int 21h
```

```
[org 0x100]
jmp start
data1 db 'Ali,Irfan,Aslam,Imran',0;
data2: times 100 db 0
```

```
start:
mov si, data1
mov di, data2
mov cx, 21
REP MOVSB
mov ax,0x4c00
```

```
int 21h
```

## Using SCAS instruction(Example)

## Using CMPS instruction(Example)

```
[org 0x100]
jmp start
STR1 db 'CCComuter',0
start:
mov di, STR1;
MOV AL, 'C';
MOV CX, 8;
REPE SCASB
;this code runs till zf remain 1.
;keep in mind the functionality of rep and
repe is different
```

```
[org 0x100]
jmp start
STR1 db 'comiputer',0
STR2 db 'computer',0
start:
mov di, STR1;
mov si, STR2;
MOV CX, 7;
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)

## Using STOSB instruction(Example)

```
[org 0x100]
jmp start
STR1 db 'AbCd123',0
STR2 db 'AbCD123',0
count db 0
start:
mov di, STR1;
Mov si, STR2;
MOV CX, 7;
L1:
LODSB
SCASB
je L2
jne L3
L2:
inc byte [count]
L3:
loop L1
mov ax,0x4c00
int 21h
;calculating how many characters same.
```

```
[org 0x100]
jmp start
STR1 db 'Assembly',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.
```

## Traversing array from left to right

## Traversing array from right to left

```
[org 0x100]
mov si,array1
mov cx,17
cld ;reset the direction flag
;increments the si and di in string
operations
rep lods

mov ax,0x4c00
int 21h
array1 db '14 January, 2019.'
```

```
[org 0x100]
mov si,array1
mov cx,17

add si,16 ;to get the address of last
character in the string.
std ;set direction flag decrements the si
and di in string operations

rep lods

mov ax,0x4c00
int 21h
array1 db '14 January, 2019.'
```



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Using string operations with video memory.

```
[org 0x100]
```

```
jmp start
```

```
data1 db 'Hello world';
```

```
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
```