#### MICROPROCESSOR AND INTERFACING TECHNIQUES

CODE: CSI2006 SLOT: L53 + L54

#### **LAB ASSIGNMENT – 6**

**AIM:** To write an assembly language program for

- Convert lower case letters to upper case
- Block transfer

#### **ALGORITHM:**

• Lower Case to Upper case a string

#### Input:

-> "ABCD" as input

#### **Process:**

- Using a stack to store the string via using push().
- Then popping out the string and as the stack stores the in LIFO manner hence our string is reversed.

**Conclusion for reversing the string:** Lower case string as output.

## **Mounting the drive**

DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: ... —

Welcome to DOSBox v0.74 For a short introduction for new users type: INTRO For supported shell commands type: HELP

To adjust the emulated CPU speed, use ctrl-F11 and ctrl-F12. To activate the keymapper ctrl-F1.

For more information read the README file in the DOSBox directory.

HAVE FUN!

The DOSBox Team http://www.dosbox.com

Z:\>SET BLASTER=A220 I7 D1 H5 T6

Z:\>mount c c:\8086 Drive C is mounted as local directory c:\8086\

Z:\>c:

C:\>edit cas.asm

C:\>masm cas.asm

C:/>\_

## Compiling the code

DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: ...

Microsoft (R) Macro Assembler Version 5.00 Copyright (C) Microsoft Corp 1981-1985, 1987. All rights reserved. Object filename [cas.OBJ]: Source listing [NUL.LST]: Cross-reference [NUL.CRF]: cas.asm(4): warning A4016: Reserved word used as symbol: TEST 51642 + 464902 Bytes symbol space free 1 Warning Errors O Severe Errors

C:\>link cas.obj

Microsoft (R) Overlay Linker Version 3.60

Copyright (C) Microsoft Corp 1983-1987. All rights reserved.

Run File [CAS.EXE]: List File [NUL.MAP]: Libraries [.LIB]:

### Debugging the code

DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: ... —  $\times$ List File [NUL.MAP]: Libraries [.LIB]: C:\>debug cas.exe -t AX=076B BX=0000 CX=0023 DX=0000 SP=0010 BP=0000 SI=0000 DI=0000 DS=075A ES=075A SS=076D CS=076A IP=0003 NV UP EI PL NZ NA PO NC 076A:0003 8ED8 MOU DS.AX -t AX=076B BX=0000 CX=0023 DX=0000 SP=0010 BP=0000 SI=0000 DI=0000 DS=076B ES=075A SS=076D CS=076A IP=0005 NV UP EI PL NZ NA PO NC 076A:0005 BECO MNU ES.AX -t AX=076B BX=0000 CX=0023 DX=0000 SP=0010 BP=0000 SI=0000 DI=0000 DS=076B ES=076B SS=076D CS=076A IP=0007 NU UP EI PL NZ NA PO NC 976A:0007 BE0C00 MOV SI,000C

## **Our input: ABCD**

```
BX=0000 CX=0023 DX=0000 SP=0010 BP=0000 SI=000C DI=0000
DS=076B ES=076B SS=076D CS=076A IP=000A NU UP EI PL NZ NA PO NC
976A:000A 8B0E1100
                     MOV
                               CX,[0011]
                                                                 DS:0011=0005
-d ds:0005
                                                                 ...L. ! .ABCD
976B:0000
                         EZ F7 B4-4C CD Z1 00 41 4Z 43 44
976B:0010 45 05 00 C4 04 50 E8 9F-0E 83 C4 04 3D FF FF 74
                                                           E....P....=..t
                                                            ...../k.....j...
976B:0020 03 E9 11 01 B8 2F 6B 07-00 00 0A 00 6A 07 A3 01
976B:0030 00 52 50 E8 EA 48 83 C4-04 50 E8 7B 0E 83 C4 04
                                                            .RP..H...P. {....
                                                            =..t....^.&.G.*
.@P.....RP..H.
          3D FF FF 74 03 E9 ED 00-C4 5E FC 26 8A 47 OC 2A
976B:0040
976B:0050
          E4 40 50 8B C3 8C C2 05-0C 00 52 50 E8 C1 48 83
976B:0060 C4 04 50 8D 86 FA FE 50-E8 17 73 83 C4 06 8B B6
                                                            ..P....P...s.....
976B:0070 FA FE 81 E6 FF 00 C6 82-FB FE 00 2B C0 50 8D 86
                                                            976B:0080 FB FE 50 E8 08
                                                            ..P..
```

DOSBox 0.74, Cp	ou speed: 3000 cy	cles, Framesk	cip 0, Program:	- 0	×
076B:0070 FA FE	50 8D 86 FA FE 50 81 E6 FF 00 C6 82 50 E8 08			PPs. + P	
AX=076B BX=0000 DS=076B ES=076B 076A:000E 8A04			BP=0000 SI=000 NV UP EI PL NZ		C=41
AX=0741 BX=0000 DS=076B ES=076B 076A:0010 0420	SS=076D CS=0766		BP=0000 SI=000 NV UP EI PL NZ		
AX=0761 BX=0000 DS=076B ES=076B 076A:0012 8804	SS=076D CS=0766		BP=0000 SI=000 NV UP EI PL NZ		C=41
AX=0761 BX=0000 DS=076B ES=076B 076A:0014 46	SS=076D CS=0766	A IP=0014	BP=0000 SI=000 NV UP EI PL NZ		
AX=0761 BX=0000 DS=076B ES=076B 076A:0015 E2F7	SS=076D CS=0766		BP=0000 SI=000 NV UP EI PL NZ		

DOSE	30x 0.74, Cp	ou speed:	3000 cycle	es, Framesk	ip 0, Program:	- 🗆	$\times$
			CS=076A		BP=0000 SI=000 NU UP EI PL NZ		
DS=076B	BX=0000 ES=076B E 8A04	SS=076D	CS=076A		BP=0000 SI=000 NU UP EI PL NZ	NA PO NC	90D=42
DS=076B	BX=0000 ES=076B 0 0420		CS=076A	IP=0010	BP=0000 SI=000 NU UP EI PL NZ		
DS=076B	BX=0000 ES=076B 2 8804		CS=076A		BP=0000 SI=000 NU UP EI PL NZ	NA PO NC	90D=42
DS=076B	BX=0000 ES=076B 4 46		CS=076A		BP=0000 SI=000 NU UP EI PL NZ		
DS=076B	BX=0000 ES=076B 5 E2F7		DX=0000 CS=076A OP 000	IP=0015	BP=0000 SI=000 NV UP EI PL NZ		

BB DOSBox 0.74, Cpu speed:	3000 cycles, Frameskip	0, Program:
----------------------------	------------------------	-------------

AX=0762	BX=0000	CX=0003	DX=0000	SP=0010	BP=0000 SI=000E DI=0000
DS=076B	ES=076B	SS=076D	CS=076A	IP=000E	NU UP EI PL NZ NA PO NC
976A:000 -t	E 8A04	MO	V AL,	[31]	DS:000E=43
1X=0743	BX=0000	CX=0003	DX=0000	SP=0010	BP=0000 SI=000E DI=0000
DS=076B	ES=076B	SS=076D	CS=076A	IP=0010	NU UP EI PL NZ NA PO NC
976A:001 -t	0 0420	AD	D AL,	20	
AX=0763	BX=0000	CX=0003	DX=0000	SP=0010	BP=0000 SI=000E DI=0000
DS=076B	ES=076B	SS=076D	CS=076A	IP=0012	NU UP EI PL NZ NA PE NC
976A:001 -t	2 8804	MO	v [S]	1,AL	DS:000E=43
1X=0763	BX=0000	CX=0003	DX=0000	SP=0010	BP=0000 SI=000E DI=0000
DS=076B	ES=076B	SS=076D	CS=076A	IP=0014	NU UP EI PL NZ NA PE NC
976A:001 -t	4 46	IN	C SI		
AX=0763	BX=0000	CX=0003	DX=0000	SP=0010	BP=0000 SI=000F DI=0000
DS=076B	ES=076B	SS=076D	CS=076A	IP=0015	NU UP EI PL NZ NA PE NC
976A:001	5 EZF7	LO	OP 000	E	

BOSBox 0.74, Cp	ou speed: 3000	cycles, Framesk	ip 0, Program: —	
AX=0763 BX=0000 DS=076B ES=076B 076A:000E 8A04 -t	SS=076D CS=0	9000 SP=0010 976A IP=000E AL,[SI]	BP=0000 SI=000F DI=0 NU UP EI PL NZ NA PE	
AX=0744 BX=0000 DS=076B ES=076B 076A:0010 0420 -t		976A IP=0010 AL,20	BP=0000 SI=000F DI=0 NU UP EI PL NZ NA PE	
AX=0764 BX=0000 DS=076B ES=076B 076A:0012 8804 -t		9000 SP=0010 976A IP=0012 [SI],AL	BP=0000 SI=000F DI=0 NU UP EI PL NZ NA PO	
AX=0764 BX=0000 DS=076B ES=076B 976A:0014 46 -t		99000 SP=0010 976A IP=0014 SI	BP=0000 SI=000F DI=0 NV UP EI PL NZ NA PO	
AX=0764 BX=0000 DS=076B ES=076B 076A:0015 E2F7		9000 SP=0010 976A IP=0015 000E	BP=0000 SI=0010 DI=0 NV UP EI PL NZ AC PO	

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: ... —
                                                                       ×
        BX=0000 CX=0001 DX=0000 SP=0010 BP=0000 SI=0010 DI=0000
AX=0764
DS=076B ES=076B SS=076D CS=076A IP=000E
                                           NU UP EI PL NZ AC PO NC
076A:000E 8A04
                      MOU
                              AL,[SI]
                                                                DS:0010=45
-t
AX=0745 BX=0000 CX=0001 DX=0000 SP=0010 BP=0000 SI=0010 DI=0000
DS=076B ES=076B SS=076D CS=076A IP=0010 NV UP EI PL NZ AC PO NC
076A:0010 0420
                      ADD
                              AL,20
-t
AX=0765 BX=0000 CX=0001 DX=0000 SP=0010 BP=0000 SI=0010 DI=0000
DS=076B ES=076B SS=076D CS=076A IP=0012 NV UP EI PL NZ NA PE NC
076A:0012 8804
                      MOV
                              [SI],AL
                                                                DS:0010=45
-\mathbf{t}
AX=0765 BX=0000 CX=0001 DX=0000 SP=0010 BP=0000 SI=0010 DI=0000
DS=076B ES=076B SS=076D CS=076A
                                 IP=0014
                                          NU UP EI PL NZ NA PE NC
                      INC
076A:0014 46
                              SI
-\mathbf{t}
AX=0765 BX=0000 CX=0001 DX=0000 SP=0010 BP=0000 SI=0011 DI=0000
DS=076B ES=076B SS=076D CS=076A IP=0015 NV UP EI PL NZ NA PE NC
076A:0015 E2F7
                      LOOP
                              000E
```

# Our input: abcd

DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: ... X AX=0765 BX=0000 CX=0001 DX=0000 SP=0010 BP=0000 SI=0011 DI=0000 DS=076B ES=076B SS=076D CS=076A IP=0015 NU UP EI PL NZ NA PE NC 076A:0015 E2F7 LOOP 000E -t BX=0000 CX=0000 DX=0000 SP=0010 BP=0000 SI=0011 DI=0000 AX=0765 DS=076B ES=076B SS=076D CS=076A IP=0017 NU UP EI PL NZ NA PE NC 076A:0017 B44C MOU AH,4C -t AX=4C65 BX=0000 CX=0000 DX=0000 SP=0010 BP=0000 SI=0011 DI=0000 DS=076B ES=076B SS=076D CS=076A IP=0019 NV UP EI PL NZ NA PE NC 076A:0019 CD21 INT -d ds:0005 076B:0000 EZ F7 B4-4C CD Z1 00 61 62 63 64 ...L.!.abcd 076B:0010 65 05 00 C4 04 50 E8 9F-0E 83 C4 04 3D FF FF 74 e....P.....=..t 03 E9 11 01 B8 2F 65 4C-00 00 19 00 6A 07 A3 01 076B:0020 ...../eL....j... 076B:0030 00 52 50 E8 EA 48 83 C4-04 50 E8 7B 0E 83 C4 04 .RP..H...P. {.... =..t....^.&.G.\* .@P......RP..H. 076B:0040 3D FF FF 74 03 E9 ED 00-C4 5E FC 26 8A 47 OC 2A E4 40 50 8B C3 8C C2 05-0C 00 52 50 E8 C1 48 83 076B:0050 C4 04 50 8D 86 FA FE 50-E8 17 73 83 C4 06 8B B6 076B:0060 ..P....P...s..... 00 C6 82-FB FE 00 2B C0 50 8D 86 076B:0070 FA FE 81 E6 FF ..P... 076B:0080 FB FE 50 E8 08