

## MICROPROCESSOR AND INTERFACING TECHNIQUES

CODE: CSI2006

SLOT: L53 + L54

### LAB ASSIGNMENT – 6

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**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

```
DOS BOX 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:\>_
```

## Compiling the code

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

C:\>masm cas.asm
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
0 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: ...
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  NU UP EI PL NZ NA PO NC
076A:0003 8ED8          MOV     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  NU UP EI PL NZ NA PO NC
076A:0005 8EC0          MOV     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
076A:0007 BE0C00       MOV     SI,000C
```

## Our input : ABCD

```
-t

AX=076B 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
076A:000A 8B0E1100       MOV     CX,[0011]          DS:0011=0005
-d ds:0005
076B:0000          E2 F7 B4-4C CD 21 00 41 42 43 44      ...L.!..ABCD
076B:0010  45 05 00 C4 04 50 E8 9F-0E 83 C4 04 3D FF FF 74  E....P.....=.t
076B:0020  03 E9 11 01 B8 2F 6B 07-00 00 0A 00 6A 07 A3 01  ....k.....j...
076B:0030  00 52 50 E8 EA 48 83 C4-04 50 E8 7B 0E 83 C4 04  .RP..H...P.{...
076B:0040  3D FF FF 74 03 E9 ED 00-C4 5E FC 26 8A 47 0C 2A  =.t.....^.&.G.*
076B:0050  E4 40 50 8B C3 8C C2 05-0C 00 52 50 E8 C1 48 83  .@P.....RP..H.
076B:0060  C4 04 50 8D 86 FA FE 50-E8 17 73 83 C4 06 8B B6  ..P....P..s....
076B:0070  FA FE 81 E6 FF 00 C6 82-FB FE 00 2B C0 50 8D 86  .....+.P..
076B:0080  FB FE 50 E8 08          ..P..
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: ...
076B:0060 C4 04 50 8D 86 FA FE 50-E8 17 73 83 C4 06 8B B6 ..P....P..s.....
076B:0070 FA FE 81 E6 FF 00 C6 82-FB FE 00 2B C0 50 8D 86 .....+.P..
076B:0080 FB FE 50 E8 08 ..P..
-t5

AX=076B BX=0000 CX=0005 DX=0000 SP=0010 BP=0000 SI=000C DI=0000
DS=076B ES=076B SS=076D CS=076A IP=000E NU UP EI PL NZ NA PO NC
076A:000E 8A04 MOV AL,[SI] DS:000C=41

AX=0741 BX=0000 CX=0005 DX=0000 SP=0010 BP=0000 SI=000C DI=0000
DS=076B ES=076B SS=076D CS=076A IP=0010 NU UP EI PL NZ NA PO NC
076A:0010 0420 ADD AL,20

AX=0761 BX=0000 CX=0005 DX=0000 SP=0010 BP=0000 SI=000C DI=0000
DS=076B ES=076B SS=076D CS=076A IP=0012 NU UP EI PL NZ NA PO NC
076A:0012 8804 MOV [SI],AL DS:000C=41

AX=0761 BX=0000 CX=0005 DX=0000 SP=0010 BP=0000 SI=000C DI=0000
DS=076B ES=076B SS=076D CS=076A IP=0014 NU UP EI PL NZ NA PO NC
076A:0014 46 INC SI

AX=0761 BX=0000 CX=0005 DX=0000 SP=0010 BP=0000 SI=000D DI=0000
DS=076B ES=076B SS=076D CS=076A IP=0015 NU UP EI PL NZ NA PO NC
076A:0015 E2F7 LOOP 000E
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: ...
AX=0761 BX=0000 CX=0005 DX=0000 SP=0010 BP=0000 SI=000D DI=0000
DS=076B ES=076B SS=076D CS=076A IP=0015 NU UP EI PL NZ NA PO NC
076A:0015 E2F7 LOOP 000E
-t5

AX=0761 BX=0000 CX=0004 DX=0000 SP=0010 BP=0000 SI=000D DI=0000
DS=076B ES=076B SS=076D CS=076A IP=000E NU UP EI PL NZ NA PO NC
076A:000E 8A04 MOV AL,[SI] DS:000D=42

AX=0742 BX=0000 CX=0004 DX=0000 SP=0010 BP=0000 SI=000D DI=0000
DS=076B ES=076B SS=076D CS=076A IP=0010 NU UP EI PL NZ NA PO NC
076A:0010 0420 ADD AL,20

AX=0762 BX=0000 CX=0004 DX=0000 SP=0010 BP=0000 SI=000D DI=0000
DS=076B ES=076B SS=076D CS=076A IP=0012 NU UP EI PL NZ NA PO NC
076A:0012 8804 MOV [SI],AL DS:000D=42

AX=0762 BX=0000 CX=0004 DX=0000 SP=0010 BP=0000 SI=000D DI=0000
DS=076B ES=076B SS=076D CS=076A IP=0014 NU UP EI PL NZ NA PO NC
076A:0014 46 INC SI

AX=0762 BX=0000 CX=0004 DX=0000 SP=0010 BP=0000 SI=000E DI=0000
DS=076B ES=076B SS=076D CS=076A IP=0015 NU UP EI PL NZ NA PO NC
076A:0015 E2F7 LOOP 000E
```



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
076A:000E 8A04      MOV     AL,[SI]          DS:000E=43
-t

AX=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
076A:0010 0420      ADD     AL,20
-t

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
076A:0012 8804      MOV     [SI],AL          DS:000E=43
-t

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=0014  NU UP EI PL NZ NA PE NC
076A:0014 46        INC     SI
-t

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
076A:0015 E2F7      LOOP    000E
```

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

```
AX=0763 BX=0000 CX=0002 DX=0000 SP=0010 BP=0000 SI=000F DI=0000
DS=076B ES=076B SS=076D CS=076A IP=000E  NU UP EI PL NZ NA PE NC
076A:000E 8A04      MOV     AL,[SI]          DS:000F=44
-t

AX=0744 BX=0000 CX=0002 DX=0000 SP=0010 BP=0000 SI=000F DI=0000
DS=076B ES=076B SS=076D CS=076A IP=0010  NU UP EI PL NZ NA PE NC
076A:0010 0420      ADD     AL,20
-t

AX=0764 BX=0000 CX=0002 DX=0000 SP=0010 BP=0000 SI=000F DI=0000
DS=076B ES=076B SS=076D CS=076A IP=0012  NU UP EI PL NZ NA PO NC
076A:0012 8804      MOV     [SI],AL          DS:000F=44
-t

AX=0764 BX=0000 CX=0002 DX=0000 SP=0010 BP=0000 SI=000F DI=0000
DS=076B ES=076B SS=076D CS=076A IP=0014  NU UP EI PL NZ NA PO NC
076A:0014 46        INC     SI
-t

AX=0764 BX=0000 CX=0002 DX=0000 SP=0010 BP=0000 SI=0010 DI=0000
DS=076B ES=076B SS=076D CS=076A IP=0015  NU UP EI PL NZ AC PO NC
076A:0015 E2F7      LOOP    000E
```

```

DOS BOX DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: ...
AX=0764 BX=0000 CX=0001 DX=0000 SP=0010 BP=0000 SI=0010 DI=0000
DS=076B ES=076B SS=076D CS=076A IP=000E NU UP EI PL NZ AC PO NC
076A:000E 8A04 MOV 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 NU 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 NU UP EI PL NZ NA PE NC
076A:0012 8804 MOV [SI],AL DS:0010=45
-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
076A:0014 46 INC SI
-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 NU UP EI PL NZ NA PE NC
076A:0015 E2F7 LOOP 000E

```

## Our input : abcd

```

DOS BOX DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: ...
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
AX=0765 BX=0000 CX=0000 DX=0000 SP=0010 BP=0000 SI=0011 DI=0000
DS=076B ES=076B SS=076D CS=076A IP=0017 NU UP EI PL NZ NA PE NC
076A:0017 B44C MOV 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 NU UP EI PL NZ NA PE NC
076A:0019 CD21 INT 21
-d ds:0005
076B:0000 E2 F7 B4-4C CD 21 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
076B:0020 03 E9 11 01 B8 2F 65 4C-00 00 19 00 6A 07 A3 01 ...../eL....j...
076B:0030 00 52 50 E8 EA 48 83 C4-04 50 E8 7B 0E 83 C4 04 .RP..H...P.{....
076B:0040 3D FF FF 74 03 E9 ED 00-C4 5E FC 26 8A 47 0C 2A =..t.....^.&.G.*
076B:0050 E4 40 50 8B C3 8C C2 05-0C 00 52 50 E8 C1 48 83 .@P.....RP..H.
076B:0060 C4 04 50 8D 86 FA FE 50-E8 17 73 83 C4 06 8B B6 ..P....P..s.....
076B:0070 FA FE 81 E6 FF 00 C6 82-FB FE 00 2B C0 50 8D 86 .....+.P...
076B:0080 FB FE 50 E8 08 ..P..

```