

MICROPROCESSOR AND INTERFACING TECHNIQUES

CODE: CSI2006

SLOT: L53 + L54

LAB ASSIGNMENT – 4

AIM:

To write an assembly language program for

- Arranging numbers in ascending and descending order using bubble sort.
- Displaying the system time.

ALGORITHM:

For Bubble sort:

Input: -> enter the count value

-> List of elements

Process: -> compare two numbers via iterations.

Conclusion: Numbers ordered in ascending and descending.

For displaying time:

Conclusion: System time displayed in HH:MM:SS format.

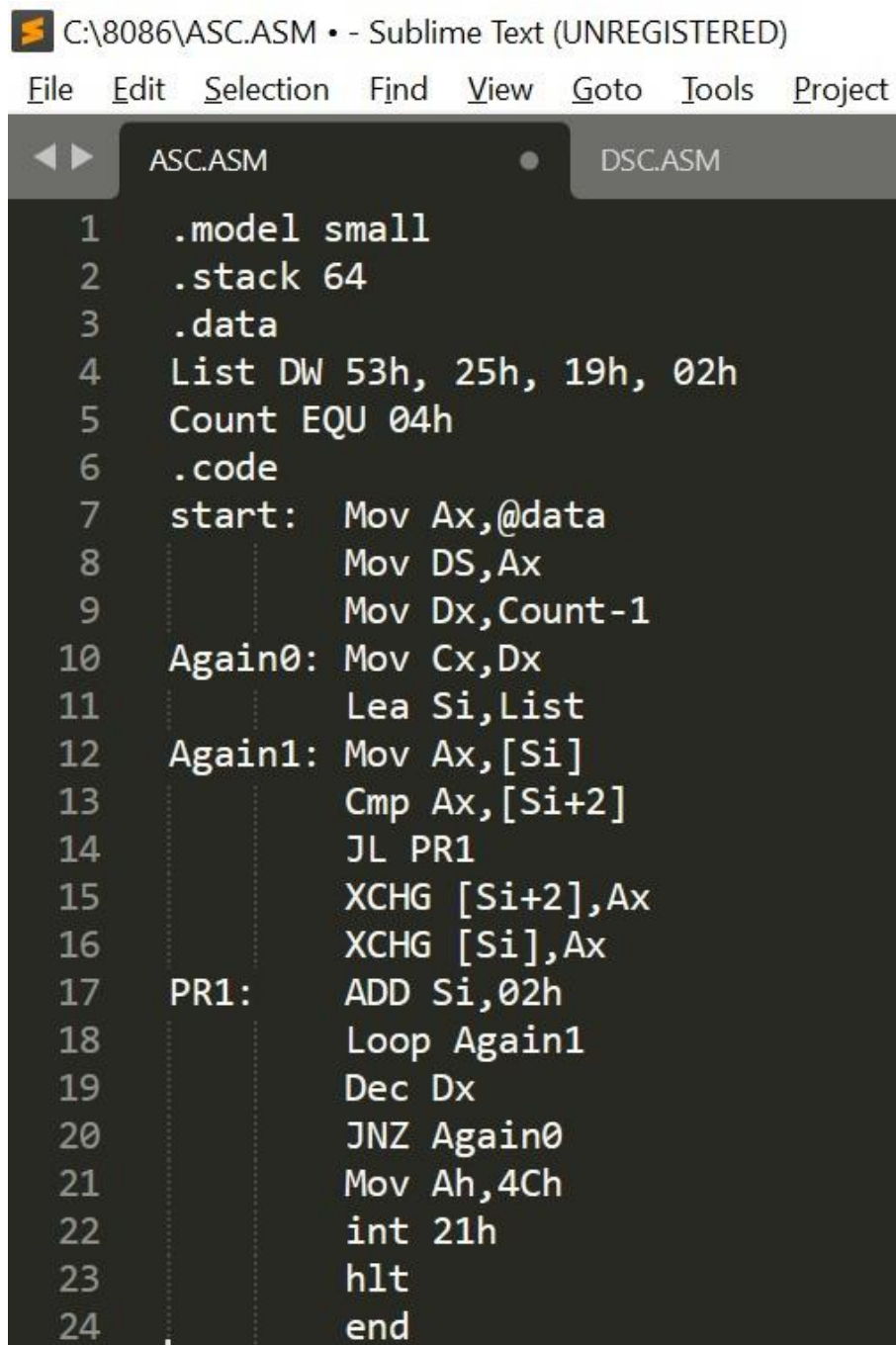
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1)

a) ALP for sorting elements in ascending order using bubble sort.

CODE:



The screenshot shows a Sublime Text editor window titled "C:\8086\ASC.ASM • - Sublime Text (UNREGISTERED)". The menu bar includes File, Edit, Selection, Find, View, Goto, Tools, and Project. The editor has two tabs: "ASC.ASM" (active) and "DSC.ASM". The code in the active tab is an assembly program for bubble sort, numbered 1 to 24. The code defines a small model, sets up a stack, and defines data for a list of four bytes (53h, 25h, 19h, 02h) and a count of four. The program starts at a label 'start', moves the data segment register (DS) to point to the data, and initializes a counter (DX) to Count-1. It then enters a loop labeled 'Again0' where it moves the counter to CX. Inside 'Again0', it moves the address of the first element to SI and enters a loop labeled 'Again1'. In 'Again1', it compares the current element with the next one (SI+2). If the current element is less than the next (JL PR1), it swaps them using XCHG. After the swap, it increments SI by 02h and loops back to 'Again1'. Once the inner loop is done, it decrements DX and loops back to 'Again0' if DX is not zero (JNZ Again0). Finally, it moves AH to 4Ch, issues an interrupt 21h, and halts.

```
1  .model small
2  .stack 64
3  .data
4  List DW 53h, 25h, 19h, 02h
5  Count EQU 04h
6  .code
7  start:  Mov Ax,@data
8          Mov DS,Ax
9          Mov Dx,Count-1
10 Again0: Mov Cx,Dx
11          Lea Si,List
12 Again1: Mov Ax,[Si]
13          Cmp Ax,[Si+2]
14          JL PR1
15          XCHG [Si+2],Ax
16          XCHG [Si],Ax
17 PR1:    ADD Si,02h
18          Loop Again1
19          Dec Dx
20          JNZ Again0
21          Mov Ah,4Ch
22          int 21h
23          hlt
24          end
```

OUTPUT:

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG

C:\>masm asc.asm
Microsoft (R) Macro Assembler Version 5.00
Copyright (C) Microsoft Corp 1981-1985, 1987. All rights reserved.

Object filename [asc.OBJ]:
Source listing [NUL.LST]:
Cross-reference [NUL.CRF]:

    51606 + 464938 Bytes symbol space free

    0 Warning Errors
    0 Severe Errors

C:\>link asc.obj

Microsoft (R) Overlay Linker Version 3.60
Copyright (C) Microsoft Corp 1983-1987. All rights reserved.

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

C:\>debug asc.exe
_
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG

AX=076C BX=0000 CX=0030 DX=0000 SP=0040 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=076C BX=0000 CX=0030 DX=0000 SP=0040 BP=0000 SI=0000 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0005  NU UP EI PL NZ NA PO NC
076A:0005 BA0300       MOV     DX,0003
-t

AX=076C BX=0000 CX=0030 DX=0003 SP=0040 BP=0000 SI=0000 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0008  NU UP EI PL NZ NA PO NC
076A:0008 8BCA          MOV     CX,DX
-t

AX=076C BX=0000 CX=0003 DX=0003 SP=0040 BP=0000 SI=0000 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000A  NU UP EI PL NZ NA PO NC
076A:000A 8D360800      LEA     SI,[0008]          DS:0008=0053
-t

AX=076C BX=0000 CX=0003 DX=0003 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000E  NU UP EI PL NZ NA PO NC
076A:000E 8B04          MOV     AX,[SI]          DS:0008=0053
_
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=076C BX=0000 CX=0003 DX=0003 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000E  NU UP EI PL NZ NA PO NC
076A:000E 8B04          MOV     AX,[SI]          DS:0008=0053
-t

AX=0053 BX=0000 CX=0003 DX=0003 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0010  NU UP EI PL NZ NA PO NC
076A:0010 3B4402       CMP     AX,[SI+02]       DS:000A=0025
-t

AX=0053 BX=0000 CX=0003 DX=0003 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0013  NU UP EI PL NZ AC PE NC
076A:0013 7C05          JL      001A
-t

AX=0053 BX=0000 CX=0003 DX=0003 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0015  NU UP EI PL NZ AC PE NC
076A:0015 874402       XCHG    AX,[SI+02]       DS:000A=0025
-t

AX=0025 BX=0000 CX=0003 DX=0003 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0018  NU UP EI PL NZ AC PE NC
076A:0018 8704          XCHG    AX,[SI]          DS:0008=0053
-
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0025 BX=0000 CX=0003 DX=0003 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0018  NU UP EI PL NZ AC PE NC
076A:0018 8704          XCHG    AX,[SI]          DS:0008=0053
-t

AX=0053 BX=0000 CX=0003 DX=0003 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001A  NU UP EI PL NZ AC PE NC
076A:001A 83C602       ADD     SI,+02
-t

AX=0053 BX=0000 CX=0003 DX=0003 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001D  NU UP EI PL NZ NA PE NC
076A:001D E2EF          LOOP   000E
-t

AX=0053 BX=0000 CX=0002 DX=0003 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000E  NU UP EI PL NZ NA PE NC
076A:000E 8B04          MOV     AX,[SI]          DS:000A=0053
-t

AX=0053 BX=0000 CX=0002 DX=0003 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0010  NU UP EI PL NZ NA PE NC
076A:0010 3B4402       CMP     AX,[SI+02]       DS:000C=0019
-
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0053 BX=0000 CX=0002 DX=0003 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0013  NU UP EI PL NZ AC PE NC
076A:0013 7C05          JL      001A
-t

AX=0053 BX=0000 CX=0002 DX=0003 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0015  NU UP EI PL NZ AC PE NC
076A:0015 874402      XCHG    AX,[SI+02]          DS:000C=0019
-t

AX=0019 BX=0000 CX=0002 DX=0003 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0018  NU UP EI PL NZ AC PE NC
076A:0018 8704      XCHG    AX,[SI]          DS:000A=0053
-t

AX=0053 BX=0000 CX=0002 DX=0003 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001A  NU UP EI PL NZ AC PE NC
076A:001A 83C602      ADD     SI,+02
-t

AX=0053 BX=0000 CX=0002 DX=0003 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001D  NU UP EI PL NZ NA PE NC
076A:001D E2EF      LOOP    000E
-
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0053 BX=0000 CX=0002 DX=0003 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001D  NU UP EI PL NZ NA PE NC
076A:001D E2EF      LOOP    000E
-t

AX=0053 BX=0000 CX=0001 DX=0003 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000E  NU UP EI PL NZ NA PE NC
076A:000E 8B04      MOV     AX,[SI]          DS:000C=0053
-t

AX=0053 BX=0000 CX=0001 DX=0003 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0010  NU UP EI PL NZ NA PE NC
076A:0010 3B4402      CMP     AX,[SI+02]          DS:000E=0002
-t

AX=0053 BX=0000 CX=0001 DX=0003 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0013  NU UP EI PL NZ NA PO NC
076A:0013 7C05          JL      001A
-t

AX=0053 BX=0000 CX=0001 DX=0003 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0015  NU UP EI PL NZ NA PO NC
076A:0015 874402      XCHG    AX,[SI+02]          DS:000E=0002
-
```



```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0053 BX=0000 CX=0001 DX=0003 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0015  NU UP EI PL NZ NA PO NC
076A:0015 874402          XCHG  AX,[SI+02]          DS:000E=0002
-t

AX=0002 BX=0000 CX=0001 DX=0003 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0018  NU UP EI PL NZ NA PO NC
076A:0018 8704          XCHG  AX,[SI]          DS:000C=0053
-t

AX=0053 BX=0000 CX=0001 DX=0003 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001A  NU UP EI PL NZ NA PO NC
076A:001A 83C602          ADD   SI,+02
-t

AX=0053 BX=0000 CX=0001 DX=0003 SP=0040 BP=0000 SI=000E DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001D  NU UP EI PL NZ NA PO NC
076A:001D E2EF          LOOP  000E
-t

AX=0053 BX=0000 CX=0000 DX=0003 SP=0040 BP=0000 SI=000E DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001F  NU UP EI PL NZ NA PO NC
076A:001F 4A          DEC   DX
-
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0053 BX=0000 CX=0000 DX=0002 SP=0040 BP=0000 SI=000E DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0020  NU UP EI PL NZ NA PO NC
076A:0020 75E6          JNZ   0008
-t

AX=0053 BX=0000 CX=0000 DX=0002 SP=0040 BP=0000 SI=000E DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0008  NU UP EI PL NZ NA PO NC
076A:0008 8BCA          MOV   CX,DX
-t

AX=0053 BX=0000 CX=0002 DX=0002 SP=0040 BP=0000 SI=000E DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000A  NU UP EI PL NZ NA PO NC
076A:000A 8D360800        LEA   SI,[0008]          DS:0008=0025
-t

AX=0053 BX=0000 CX=0002 DX=0002 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000E  NU UP EI PL NZ NA PO NC
076A:000E 8B04          MOV   AX,[SI]          DS:0008=0025
-t

AX=0025 BX=0000 CX=0002 DX=0002 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0010  NU UP EI PL NZ NA PO NC
076A:0010 3B4402          CMP   AX,[SI+02]          DS:000A=0019
-
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0025 BX=0000 CX=0002 DX=0002 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0010 NU UP EI PL NZ NA PO NC
076A:0010 3B4402 CMP AX,[SI+02] DS:000A=0019
-t
AX=0025 BX=0000 CX=0002 DX=0002 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0013 NU UP EI PL NZ AC PE NC
076A:0013 7C05 JL 001A
-t
AX=0025 BX=0000 CX=0002 DX=0002 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0015 NU UP EI PL NZ AC PE NC
076A:0015 874402 XCHG AX,[SI+02] DS:000A=0019
-t
AX=0019 BX=0000 CX=0002 DX=0002 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0018 NU UP EI PL NZ AC PE NC
076A:0018 8704 XCHG AX,[SI] DS:0008=0025
-t
AX=0025 BX=0000 CX=0002 DX=0002 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001A NU UP EI PL NZ AC PE NC
076A:001A 83C602 ADD SI,+02
-
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0025 BX=0000 CX=0002 DX=0002 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001A NU UP EI PL NZ AC PE NC
076A:001A 83C602 ADD SI,+02
-t
AX=0025 BX=0000 CX=0002 DX=0002 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001D NU UP EI PL NZ NA PE NC
076A:001D E2EF LOOP 000E
-t
AX=0025 BX=0000 CX=0001 DX=0002 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000E NU UP EI PL NZ NA PE NC
076A:000E 8B04 MOV AX,[SI] DS:000A=0025
-t
AX=0025 BX=0000 CX=0001 DX=0002 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0010 NU UP EI PL NZ NA PE NC
076A:0010 3B4402 CMP AX,[SI+02] DS:000C=0002
-t
AX=0025 BX=0000 CX=0001 DX=0002 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0013 NU UP EI PL NZ NA PO NC
076A:0013 7C05 JL 001A
-
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0025 BX=0000 CX=0001 DX=0002 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0013  NU UP EI PL NZ NA PO NC
076A:0013 7C05          JL      001A
-t
AX=0025 BX=0000 CX=0001 DX=0002 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0015  NU UP EI PL NZ NA PO NC
076A:0015 874402      XCHG    AX,[SI+02]          DS:000C=0002
-t
AX=0002 BX=0000 CX=0001 DX=0002 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0018  NU UP EI PL NZ NA PO NC
076A:0018 8704      XCHG    AX,[SI]          DS:000A=0025
-t
AX=0025 BX=0000 CX=0001 DX=0002 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001A  NU UP EI PL NZ NA PO NC
076A:001A 83C602      ADD     SI,+02
-t
AX=0025 BX=0000 CX=0001 DX=0002 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001D  NU UP EI PL NZ NA PE NC
076A:001D E2EF      LOOP    000E
-
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0025 BX=0000 CX=0001 DX=0002 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001D  NU UP EI PL NZ NA PE NC
076A:001D E2EF      LOOP    000E
-t
AX=0025 BX=0000 CX=0000 DX=0002 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001F  NU UP EI PL NZ NA PE NC
076A:001F 4A      DEC     DX
-t
AX=0025 BX=0000 CX=0000 DX=0001 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0020  NU UP EI PL NZ NA PO NC
076A:0020 75E6      JNZ     0008
-t
AX=0025 BX=0000 CX=0000 DX=0001 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0008  NU UP EI PL NZ NA PO NC
076A:0008 8BCA      MOV     CX,DX
-t
AX=0025 BX=0000 CX=0001 DX=0001 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000A  NU UP EI PL NZ NA PO NC
076A:000A 8D360800     LEA     SI,[0008]          DS:0008=0019
-
```



```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0025 BX=0000 CX=0001 DX=0001 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000A NU UP EI PL NZ NA PO NC
076A:000A 8D360800 LEA SI,[0008] DS:0008=0019
-t
AX=0025 BX=0000 CX=0001 DX=0001 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000E NU UP EI PL NZ NA PO NC
076A:000E 8B04 MOV AX,[SI] DS:0008=0019
-t
AX=0019 BX=0000 CX=0001 DX=0001 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0010 NU UP EI PL NZ NA PO NC
076A:0010 3B4402 CMP AX,[SI+02] DS:000A=0002
-t
AX=0019 BX=0000 CX=0001 DX=0001 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0013 NU UP EI PL NZ NA PE NC
076A:0013 7C05 JL 001A
-t
AX=0019 BX=0000 CX=0001 DX=0001 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0015 NU UP EI PL NZ NA PE NC
076A:0015 874402 XCHG AX,[SI+02] DS:000A=0002
-
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0019 BX=0000 CX=0001 DX=0001 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0015 NU UP EI PL NZ NA PE NC
076A:0015 874402 XCHG AX,[SI+02] DS:000A=0002
-t
AX=0002 BX=0000 CX=0001 DX=0001 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0018 NU UP EI PL NZ NA PE NC
076A:0018 8704 XCHG AX,[SI] DS:0008=0019
-t
AX=0019 BX=0000 CX=0001 DX=0001 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001A NU UP EI PL NZ NA PE NC
076A:001A 83C602 ADD SI,+02
-t
AX=0019 BX=0000 CX=0001 DX=0001 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001D NU UP EI PL NZ NA PE NC
076A:001D E2EF LOOP 000E
-t
AX=0019 BX=0000 CX=0000 DX=0001 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001F NU UP EI PL NZ NA PE NC
076A:001F 4A DEC DX
-
```

```

DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0019 BX=0000 CX=0000 DX=0000 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0020 NU UP EI PL ZR NA PE NC
076A:0020 75E6 JNZ 0008
-t
AX=0019 BX=0000 CX=0000 DX=0000 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0022 NU UP EI PL ZR NA PE NC
076A:0022 B44C MOV AH,4C
-t
AX=4C19 BX=0000 CX=0000 DX=0000 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0024 NU UP EI PL ZR NA PE NC
076A:0024 CD21 INT 21
-t
AX=4C19 BX=0000 CX=0000 DX=0000 SP=003A BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=F000 IP=14A0 NU UP DI PL ZR NA PE NC
F000:14A0 FB STI
-t
AX=4C19 BX=0000 CX=0000 DX=0000 SP=003A BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=F000 IP=14A1 NU UP EI PL ZR NA PE NC
F000:14A1 FE3B ??? [BX+SI] DS:000A=19
-

```

b) ALP for sorting elements in descending order using bubble sort.

CODE:

```

C:\8086\DSC.ASM - Sublime Text (UNREGISTERED)
File Edit Selection Find View Goto Tools Project Prefere
ASC.ASM DSC.ASM
1 .model small
2 .stack 64
3 .data
4 List DW 02h, 19h, 25h, 53h
5 Count EQU 04h
6 .code
7 start: Mov Ax,@data
8         Mov DS,Ax
9         Mov Dx,Count-1
10 Again0: Mov Cx,Dx
11         Lea Si,List
12 Again1: Mov Ax,[Si]
13         Cmp Ax,[Si+2]
14         JG PR1
15         XCHG [Si+2],Ax
16         XCHG [Si],Ax
17 PR1:    ADD Si,02h
18         Loop Again1
19         Dec Dx
20         JNZ Again0
21         Mov Ah,4Ch
22         int 21h
23         hlt
24         end
25

```

OUTPUT:

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DOSBOX

C:\>masm dsc.asm
Microsoft (R) Macro Assembler Version 5.00
Copyright (C) Microsoft Corp 1981-1985, 1987. All rights reserved.

Object filename [dsc.OBJ]:
Source listing [NUL.LST]:
Cross-reference [NUL.CRF]:

    51606 + 464938 Bytes symbol space free

    0 Warning Errors
    0 Severe Errors

C:\>link DSC.OBJ

Microsoft (R) Overlay Linker Version 3.60
Copyright (C) Microsoft Corp 1983-1987. All rights reserved.

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

C:\>debug dcs.exe_
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG

-q
C:\>debug dsc.exe
-t

AX=076C BX=0000 CX=0030 DX=0000 SP=0040 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=076C BX=0000 CX=0030 DX=0000 SP=0040 BP=0000 SI=0000 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0005  NU UP EI PL NZ NA PO NC
076A:0005 BA0300       MOV     DX,0003
-t

AX=076C BX=0000 CX=0030 DX=0003 SP=0040 BP=0000 SI=0000 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0008  NU UP EI PL NZ NA PO NC
076A:0008 8BCA          MOV     CX,DX
-t

AX=076C BX=0000 CX=0003 DX=0003 SP=0040 BP=0000 SI=0000 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000A  NU UP EI PL NZ NA PO NC
076A:000A 8D360800     LEA     SI,[0008]          DS:0008=0002
-
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=076C BX=0000 CX=0003 DX=0003 SP=0040 BP=0000 SI=0000 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000A NU UP EI PL NZ NA PO NC
076A:000A 8D360800 LEA SI,[0008] DS:0008=0002
-t
AX=076C BX=0000 CX=0003 DX=0003 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000E NU UP EI PL NZ NA PO NC
076A:000E 8B04 MOV AX,[SI] DS:0008=0002
-t
AX=0002 BX=0000 CX=0003 DX=0003 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0010 NU UP EI PL NZ NA PO NC
076A:0010 3B4402 CMP AX,[SI+02] DS:000A=0019
-t
AX=0002 BX=0000 CX=0003 DX=0003 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0013 NU UP EI NG NZ AC PO CY
076A:0013 7F05 JG 001A
-t
AX=0002 BX=0000 CX=0003 DX=0003 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0015 NU UP EI NG NZ AC PO CY
076A:0015 874402 XCHG AX,[SI+02] DS:000A=0019
-
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0002 BX=0000 CX=0003 DX=0003 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0015 NU UP EI NG NZ AC PO CY
076A:0015 874402 XCHG AX,[SI+02] DS:000A=0019
-t
AX=0019 BX=0000 CX=0003 DX=0003 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0018 NU UP EI NG NZ AC PO CY
076A:0018 8704 XCHG AX,[SI] DS:0008=0002
-t
AX=0002 BX=0000 CX=0003 DX=0003 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001A NU UP EI NG NZ AC PO CY
076A:001A 83C602 ADD SI,+02
-t
AX=0002 BX=0000 CX=0003 DX=0003 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001D NU UP EI PL NZ NA PE NC
076A:001D E2EF LOOP 000E
-t
AX=0002 BX=0000 CX=0002 DX=0003 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000E NU UP EI PL NZ NA PE NC
076A:000E 8B04 MOV AX,[SI] DS:000A=0002
-
```



```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0002 BX=0000 CX=0002 DX=0003 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000E  NU UP EI PL NZ NA PE NC
076A:000E 8B04          MOV     AX,[SI]          DS:000A=0002
-t
AX=0002 BX=0000 CX=0002 DX=0003 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0010  NU UP EI PL NZ NA PE NC
076A:0010 3B4402       CMP     AX,[SI+02]        DS:000C=0025
-t
AX=0002 BX=0000 CX=0002 DX=0003 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0013  NU UP EI NG NZ AC PE CY
076A:0013 7F05          JG      001A
-t
AX=0002 BX=0000 CX=0002 DX=0003 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0015  NU UP EI NG NZ AC PE CY
076A:0015 874402       XCHG    AX,[SI+02]        DS:000C=0025
-t
AX=0025 BX=0000 CX=0002 DX=0003 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0018  NU UP EI NG NZ AC PE CY
076A:0018 8704          XCHG    AX,[SI]          DS:000A=0002
-
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0025 BX=0000 CX=0002 DX=0003 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0018  NU UP EI NG NZ AC PE CY
076A:0018 8704          XCHG    AX,[SI]          DS:000A=0002
-t
AX=0002 BX=0000 CX=0002 DX=0003 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001A  NU UP EI NG NZ AC PE CY
076A:001A 83C602       ADD     SI,+02
-t
AX=0002 BX=0000 CX=0002 DX=0003 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001D  NU UP EI PL NZ NA PE NC
076A:001D E2EF          LOOP   000E
-t
AX=0002 BX=0000 CX=0001 DX=0003 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000E  NU UP EI PL NZ NA PE NC
076A:000E 8B04          MOV     AX,[SI]          DS:000C=0002
-t
AX=0002 BX=0000 CX=0001 DX=0003 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0010  NU UP EI PL NZ NA PE NC
076A:0010 3B4402       CMP     AX,[SI+02]        DS:000E=0053
-
```



```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0002 BX=0000 CX=0001 DX=0003 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0013  NU UP EI NG NZ AC PE CY
076A:0013 7F05          JG      001A
-t

AX=0002 BX=0000 CX=0001 DX=0003 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0015  NU UP EI NG NZ AC PE CY
076A:0015 874402      XCHG    AX,[SI+02]      DS:000E=0053
-t

AX=0053 BX=0000 CX=0001 DX=0003 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0018  NU UP EI NG NZ AC PE CY
076A:0018 8704      XCHG    AX,[SI]      DS:000C=0002
-t

AX=0002 BX=0000 CX=0001 DX=0003 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001A  NU UP EI NG NZ AC PE CY
076A:001A 83C602      ADD     SI,+02
-t

AX=0002 BX=0000 CX=0001 DX=0003 SP=0040 BP=0000 SI=000E DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001D  NU UP EI PL NZ NA PO NC
076A:001D E2EF      LOOP    000E
-
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0002 BX=0000 CX=0001 DX=0003 SP=0040 BP=0000 SI=000E DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001D  NU UP EI PL NZ NA PO NC
076A:001D E2EF      LOOP    000E
-      t

AX=0002 BX=0000 CX=0000 DX=0003 SP=0040 BP=0000 SI=000E DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001F  NU UP EI PL NZ NA PO NC
076A:001F 4A      DEC     DX
-t

AX=0002 BX=0000 CX=0000 DX=0002 SP=0040 BP=0000 SI=000E DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0020  NU UP EI PL NZ NA PO NC
076A:0020 75E6      JNZ     0008
-t

AX=0002 BX=0000 CX=0000 DX=0002 SP=0040 BP=0000 SI=000E DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0008  NU UP EI PL NZ NA PO NC
076A:0008 8BCA      MOV     CX,DX
-t

AX=0002 BX=0000 CX=0002 DX=0002 SP=0040 BP=0000 SI=000E DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000A  NU UP EI PL NZ NA PO NC
076A:000A 8D360800    LEA     SI,[0008]      DS:0008=0019
-
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0002 BX=0000 CX=0002 DX=0002 SP=0040 BP=0000 SI=000E DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000A  NU UP EI PL NZ NA PO NC
076A:000A 8D360800      LEA     SI,[0008]          DS:0008=0019
-
t
AX=0002 BX=0000 CX=0002 DX=0002 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000E  NU UP EI PL NZ NA PO NC
076A:000E 8B04      MOV     AX,[SI]          DS:0008=0019
-t
AX=0019 BX=0000 CX=0002 DX=0002 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0010  NU UP EI PL NZ NA PO NC
076A:0010 3B4402      CMP     AX,[SI+02]        DS:000A=0025
-t
AX=0019 BX=0000 CX=0002 DX=0002 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0013  NU UP EI NG NZ NA PO CY
076A:0013 7F05      JG      001A
-t
AX=0019 BX=0000 CX=0002 DX=0002 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0015  NU UP EI NG NZ NA PO CY
076A:0015 874402      XCHG    AX,[SI+02]        DS:000A=0025
-
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0019 BX=0000 CX=0002 DX=0002 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0015  NU UP EI NG NZ NA PO CY
076A:0015 874402      XCHG    AX,[SI+02]        DS:000A=0025
-t
AX=0025 BX=0000 CX=0002 DX=0002 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0018  NU UP EI NG NZ NA PO CY
076A:0018 8704      XCHG    AX,[SI]          DS:0008=0019
-t
AX=0019 BX=0000 CX=0002 DX=0002 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001A  NU UP EI NG NZ NA PO CY
076A:001A 83C602      ADD     SI,+02
-t
AX=0019 BX=0000 CX=0002 DX=0002 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001D  NU UP EI PL NZ NA PE NC
076A:001D E2EF      LOOP   000E
-t
AX=0019 BX=0000 CX=0001 DX=0002 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000E  NU UP EI PL NZ NA PE NC
076A:000E 8B04      MOV     AX,[SI]          DS:000A=0019
-t
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0019 BX=0000 CX=0001 DX=0002 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0010 NU UP EI PL NZ NA PE NC
076A:0010 3B4402 CMP AX,[SI+02] DS:000C=0053
-t
AX=0019 BX=0000 CX=0001 DX=0002 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0013 NU UP EI NG NZ NA PE CY
076A:0013 7F05 JG 001A
-t
AX=0019 BX=0000 CX=0001 DX=0002 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0015 NU UP EI NG NZ NA PE CY
076A:0015 874402 XCHG AX,[SI+02] DS:000C=0053
-t
AX=0053 BX=0000 CX=0001 DX=0002 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0018 NU UP EI NG NZ NA PE CY
076A:0018 8704 XCHG AX,[SI] DS:000A=0019
-t
AX=0019 BX=0000 CX=0001 DX=0002 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001A NU UP EI NG NZ NA PE CY
076A:001A 83C602 ADD SI,+02
-
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0019 BX=0000 CX=0001 DX=0002 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001D NU UP EI PL NZ NA PE NC
076A:001D E2EF LOOP 000E
-t
AX=0019 BX=0000 CX=0000 DX=0002 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001F NU UP EI PL NZ NA PE NC
076A:001F 4A DEC DX
-t
AX=0019 BX=0000 CX=0000 DX=0001 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0020 NU UP EI PL NZ NA PO NC
076A:0020 75E6 JNZ 0008
-t
AX=0019 BX=0000 CX=0000 DX=0001 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0008 NU UP EI PL NZ NA PO NC
076A:0008 8BCA MOV CX,DX
-t
AX=0019 BX=0000 CX=0001 DX=0001 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000A NU UP EI PL NZ NA PO NC
076A:000A 8D360800 LEA SI,[0008] DS:0008=0025
-
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0019 BX=0000 CX=0001 DX=0001 SP=0040 BP=0000 SI=000C DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000A NU UP EI PL NZ NA PO NC
076A:000A 8D360800 LEA SI,[0008] DS:0008=0025
-t
AX=0019 BX=0000 CX=0001 DX=0001 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=000E NU UP EI PL NZ NA PO NC
076A:000E 8B04 MOV AX,[SI] DS:0008=0025
-t
AX=0025 BX=0000 CX=0001 DX=0001 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0010 NU UP EI PL NZ NA PO NC
076A:0010 3B4402 CMP AX,[SI+02] DS:000A=0053
-t
AX=0025 BX=0000 CX=0001 DX=0001 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0013 NU UP EI NG NZ NA PE CY
076A:0013 7F05 JG 001A
-t
AX=0025 BX=0000 CX=0001 DX=0001 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0015 NU UP EI NG NZ NA PE CY
076A:0015 874402 XCHG AX,[SI+02] DS:000A=0053
-
```

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0053 BX=0000 CX=0001 DX=0001 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0018 NU UP EI NG NZ NA PE CY
076A:0018 8704 XCHG AX,[SI] DS:0008=0025
-t
AX=0025 BX=0000 CX=0001 DX=0001 SP=0040 BP=0000 SI=0008 DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001A NU UP EI NG NZ NA PE CY
076A:001A 83C602 ADD SI,+02
-t
AX=0025 BX=0000 CX=0001 DX=0001 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001D NU UP EI PL NZ NA PE NC
076A:001D E2EF LOOP 000E
-t
AX=0025 BX=0000 CX=0000 DX=0001 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001F NU UP EI PL NZ NA PE NC
076A:001F 4A DEC DX
-t
AX=0025 BX=0000 CX=0000 DX=0000 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0020 NU UP EI PL ZR NA PE NC
076A:0020 75E6 JNZ 0008
-
```



```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG
AX=0025 BX=0000 CX=0000 DX=0001 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=001F  NU UP EI PL NZ NA PE NC
076A:001F 4A          DEC     DX
-t

AX=0025 BX=0000 CX=0000 DX=0000 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0020  NU UP EI PL ZR NA PE NC
076A:0020 75E6      JNZ     0008
-t

AX=0025 BX=0000 CX=0000 DX=0000 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0022  NU UP EI PL ZR NA PE NC
076A:0022 B44C      MOV     AH,4C
-t

AX=4C25 BX=0000 CX=0000 DX=0000 SP=0040 BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=076A IP=0024  NU UP EI PL ZR NA PE NC
076A:0024 CD21      INT     21
-t

AX=4C25 BX=0000 CX=0000 DX=0000 SP=003A BP=0000 SI=000A DI=0000
DS=076C ES=075A SS=076D CS=F000 IP=14A0  NU UP DI PL ZR NA PE NC
F000:14A0 FB      STI
-

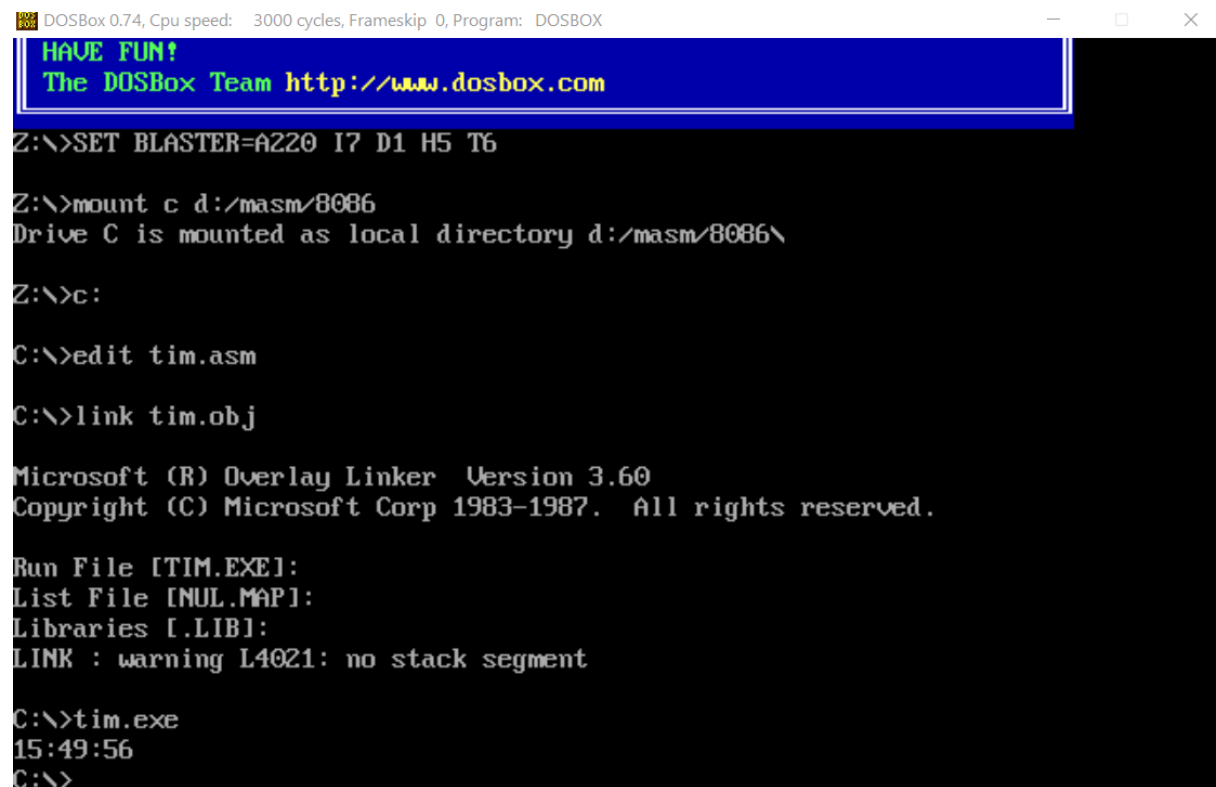
```


2.) ALP to display system timing.

CODE:

```
ASM tim.asm X
D: > MASM > 8086 > ASM tim.asm
1  .model small
2  .code
3  mov ah,2ch
4  int 21h
5  mov al,ch
6  call disp
7  mov dl, ':'
8  mov ah,2
9  int 21h
10 mov al,cl
11 call disp
12 mov dl, ':'
13 mov ah,2
14 int 21h
15 mov al,dh
16 call disp
17 mov ah,4ch
18 int 21h
19 disp proc near
20 aam
21 add ax,3030h
22 mov bx,ax
23 mov dl,ah
24 mov ah,02h
25 int 21h
26 mov dl,bl
27 int 21h
28 ret
29 disp endp
30 end
```

OUTPUT:

A screenshot of a DOSBox window. The title bar reads "DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DOSBOX". The window has a blue header bar with the text "HAVE FUN!" and "The DOSBox Team http://www.dosbox.com" in yellow. The main area is black with white text showing a series of commands and their outputs. The commands include setting BLASTER, mounting drive C, editing a file, linking an object file, and running an executable. The output shows the linker version, copyright, and a warning about a missing stack segment. The system time is displayed as 15:49:56.

```
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DOSBOX
HAVE FUN!
The DOSBox Team http://www.dosbox.com
Z:\>SET BLASTER=A220 I7 D1 H5 T6

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

Z:\>c:

C:\>edit tim.asm

C:\>link tim.obj

Microsoft (R) Overlay Linker Version 3.60
Copyright (C) Microsoft Corp 1983-1987. All rights reserved.

Run File [TIM.EXE]:
List File [NUL.MAP]:
Libraries [.LIB]:
LINK : warning L4021: no stack segment

C:\>tim.exe
15:49:56
C:\>
```

System time is 3:49 PM, and the program returns value 15:49:46 (24hr format).

VIDEO LINK:

<https://www.youtube.com/watch?v=nnaAdciLgGA>

-X-X-X-X-X-X-X-X-