

# 16.317: Microprocessor Systems Design I

Summer 2012

## Lecture 3: Key Questions

July 16, 2012

1. Describe the basic structure of an assembly language statement.

2. Describe the structure of the source file shown below:

```
TITLE    BLOCK-MOVE PROGRAM

PAGE     ,132

COMMENT  *This program moves a block of specified number of bytes
        from one place to another place*

;Define constants used in this program

N        =        16                ;Bytes to be moved
BLK1ADDR=        100H              ;Source block offset address
BLK2ADDR=        120H              ;Destination block offset address
DATASEGADDR=      1020H            ;Data segment start address

STACK_SEG      SEGMENT              STACK 'STACK'
DB              64 DUP(?)
STACK_SEG      ENDS

CODE_SEG       SEGMENT              'CODE'
BLOCK          PROC                  FAR
        ASSUME CS:CODE_SEG,SS:STACK_SEG

;To return to DEBUG program put return address on the stack

        PUSH    DS
        MOV     AX, 0
        PUSH    AX

;Set up the data segment address

        MOV     AX, DATASEGADDR
        MOV     DS, AX

;Set up the source and destination offset addresses

        MOV     SI, BLK1ADDR
        MOV     DI, BLK2ADDR

;Set up the count of bytes to be moved

        MOV     CX, N

;Copy source block to destination block

NXTPT:  MOV     AH, [SI]              ;Move a byte
        MOV     [DI], AH
        INC     SI                    ;Update pointers
        INC     DI
        DEC     CX                    ;Update byte counter
        JNZ     NXTPT                ;Repeat for next byte
        RET                          ;Return to DEBUG program

BLOCK          ENDP
CODE_SEG       ENDS
END            BLOCK                  ;End of program
```

- 2

6. Describe how the 80386 registers are accessed as 8-bit, 16-bit, and 32-bit values. Include the answer to the example provided in the slides (EAX = 1A2B3C4DH).
7. Describe how to determine the number of bytes being accessed from memory in an 80386DX instruction.

8. Describe the use of the MOV instruction.

9. The example program below shows the initialization of internal registers with immediate data and address information, using MOV instructions. Show the state of all affected registers. Also, explain why AX is used to initialize segment registers.

```
MOV AX,2000H
MOV DS,AX
MOV ES,AX
MOV AX,3000H
MOV SS,AX
MOV AX,0H
MOV BX,AX
MOV CX,0AH
MOV DX,100H
MOV SI,200H
MOV DI,300H
```

10. Describe the operation of the MOVZX/MOVZX instructions. How/when are these instructions useful?

11. Assume: AX = 0100H, DX = 8100H, (DS:100H) = 00H, (DS:101H) = FFH. What are the results of the following instructions?

a. MOVZX EBX, AX

b. MOVZX EBX, DX

c. MOVZX EBX, DX

d. MOVZX EBX, BYTE PTR [100H]

e. MOVZX EBX, WORD PTR [100H]

12. Explain the operation of the XCHG instruction. What restrictions are placed on this instruction?

13. Explain the operation of the LEA instruction.

14. Explain the operation of the instructions used for loading a full address pointer (LDS, LSS, LES, LFS, LGS).

15. Show the results of running the following program if DATA\_SEG\_ADDR = 1200H, assuming the memory contents shown:

DATA\_SEG\_ADDR:0000

DATA\_SEG\_ADDR:INIT\_TABLE

11	22	
33	44	
55	66	
77	88	
99	AA	
BB	CC	
DD	EE	
FF	16	
03	17	

```
MOV AX, DATA_SEG_ADDR
MOV DS, AX
MOV SI, [INIT_TABLE]
LES DI, [INIT_TABLE+02H]
MOV AX, [INIT_TABLE+06H]
MOV SS, AX
MOV AX, [INIT_TABLE+08H]
MOV BX, [INIT_TABLE+0AH]
MOV CX, [INIT_TABLE+0CH]
MOV DX, [INIT_TABLE+0EH]
```

16. Describe the 80386DX flags.

17. Describe the operation of the ADD, ADC, and INC instructions.

18. Describe the operation of the SUB, SBB, DEC, and NEG instructions.



19. Given the following initial state:

- AX = 1234H
- BL = ABH
- Memory location SUM = 00CDH

Show the results of each step of the following instruction sequence. Be sure to track the carry flag throughout the sequence:

```
ADD AX, [SUM]
ADC BL, 05H
NEG BL
SUB AX, 12H
INC WORD PTR [SUM]
```