16.317: Microprocessor Systems Design I

Spring 2012

Homework 2

Due **Friday, 2/17/12**

Most problems in this assignment are based on problems in the textbook, although they have been modified in some cases—do not assume that simply doing the problem directly from the text will be sufficient.

1. *(Chapter 3, #28)* List and describe all addressing modes available on the 80386DX.

2. *(Chapter 3, #32)* Compute the physical address for the specified operand in each of the following instructions. The register contents and variables are as follows:

   - (CS) = $0A00_{16}$
   - (DS) = $0B00_{16}$
   - (ESI) = 00000100_{16}
   - (EDI) = 00000200_{16}
   - (EBX) = 00000300_{16}

a. Destination operand in: MOV [DI], AX
b. Source operand in: MOV DI, [SI]
c. Destination operand in: MOV [BX+0400H], CX
d. Destination operand in: MOV [DI+0400H], AH
e. Destination operand in MOV [BX+DI+0400H], AL

3. *(Chapter 5, #6)* Describe the operation performed by the instruction:

   MOVSX EAX, BL

   What would the result of this instruction be if EBX = 16317012_{16}? What if EBX = $89ABCDEF_{16}$?

4. *(Chapter 5, #15)* Assume the state of the 80386DX's registers and memory are::
   - (EAX) = 00000010H
   - (EBX) = 00000020H
   - (ECX) = 00000030H
   - (EDX) = 00000040H
   - (ESI) = 00000100H
   - (EDI) = 00000200H
   - (CF) = 1
   - (DS:100H) = 10H
   - (DS:101H) = 00H
   - (DS:120H) = FFH
   - (DS:121H) = FFH
   - (DS:130H) = 08H
   - (DS:131H) = 00H
   - (DS:150H) = 02H
   - (DS:151H) = 00H
   - (DS:200H) = 30H
   - (DS:201H) = 00H
   - (DS:210H) = 40H
   - (DS:211H) = 00H
   - (DS:220H) = 30H
   - (DS:221H) = 00H

What is the result produced in the destination operand by each of the instructions listed below? Assume that each instruction executes independently—your answer to part (b), for example, does not depend on your answer to part (a).

a. ADD AX, 00FFH
b. ADC SI, AX
c. INC BYTE PTR [0100H]
d. SUB DL, BL
e. SBB DL, [0200H]
f. DEC BYTE PTR [DI+BX]
   - Note: this addressing mode is equivalent to based-indexed mode with a displacement of 0.
g. NEG BYTE PTR [DI]+0010H
h. MUL DX
i. IMUL BYTE PTR [BX+SI]
j. DIV BYTE PTR [SI]+0030H
k. IDIV BYTE PTR[BX][SI]+0030H

5. *(Chapter 5, #26)* Assume the state of the 80386DX's registers and memory are::

- (EAX) = 00005555H
- (EBX) = 00000010H
- (ECX) = 00000010H
- (EDX) = 0000AAAAH
- (ESI) = 00000100H
- (EDI) = 00000200H
- (DS:100H) = 0FH
- (DS:101H) = F0H
- (DS:110H) = 00H
- (DS:111H) = FFH
- (DS:200H) = 30H
- (DS:201H) = 00H
- (DS:210H) = AAH
- (DS:211H) = AAH
- (DS:220H) = 55H
- (DS:221H) = 55H
- (DS:300H) = AAH
- (DS:301H) = 55H

What is the result produced in the destination operand by each of the instructions listed below? Assume that each instruction executes independently—your answer to part (b), for example, does not depend on your answer to part (a).

a. AND BYTE PTR [0300H], 0FH
b. AND DX, [SI]
c. OR [BX+DI], AX
d. OR BYTE PTR [BX][DI]+10H, F0H
e. XOR AX, [SI+BX]
f. NOT BYTE PTR [0300H]
g. NOT WORD PTR [BX+DI]