16.317: Microprocessor Systems Design I

Spring 2013

Homework 1

Due **Friday, 2/8/12**

1. (20 points) Name and describe each of the four general types of operations implemented by most microprocessors. Provide a specific example of an operation in each class.

2. (25 points) Given each of the binary or hexadecimal number below, determine what the decimal value is if the number is (i) an unsigned integer, and (ii) a signed integer. Note that, in some cases, your answers for both will be the same.

a. 01011100_2
b. 10110110_2
c. DBH (or 0xDB—recall that, in x86 assembly notation, the "H" at the end of a number signifies that the previous value is in hexadecimal)
d. 5E1FH
e. ACEDH

3. (30 points) Assume the state of the 80386DX registers are as follows:

   - (DS) = 7BD1H
   - (ES) = E955H
   - (SS) = 1617H
   - (ESI) = 00001BB0H
   - (EDI) = 00005AA2H
   - (EBX) = 001AB2CCH
   - (ESP) = FFEECCA3H

   Given each of the logical addresses listed below, answer the following questions:
   - What physical address corresponds to the given logical address?
   - If the processor accesses a word at that address, is the access aligned?
   - If the processor accesses a double word at that address, is the access aligned?

a. DS:SI
b. ES:DI
c. SS:SP
d. DS:BX
e. ES:3A3AH

4. (25 points) Assume the state of the 80386DX registers are as follows:

   - (DS) = A117H
   - (ES) = 3300H
   - (ESI) = 0000E11CH
   - (EDI) = 00001CD8H
   - (EBX) = 0000A229H

For each of the instructions below, determine the physical address for the memory operand in each instruction. Recall that memory operands are indicated by square brackets [ ], and that either the source or destination may be a memory operand.

a. MOV AX, [SI]

b. MOV ES:[D45DH], BX

c. MOV CX, ES:[SI+2002H]

d. MOV DX, [BX+SI]

e. MOV ES:[32H+BX+DI], AX