

# **EECE.3170: Microprocessor Systems Design I**

Summer 2017

## Lecture 2: Key Questions May 17, 2017

1. Describe the general characteristics of the x86 architecture.

2. Briefly describe the x86 registers.

3. Describe the different memory spaces in the x86 architecture.

4. Describe the specifics of x86 memory addressing within instructions.

5. **Example:** Compute the address for the memory operand in each of the following instructions. The register contents and variables are as follows:

- $(ESI) = 00000100_{16}$
- $(EDI) = 00000200_{16}$
- $(EBX) = 00000300_{16}$

a. Destination operand in: `MOV [EBX+0x0400], CX`

b. Destination operand in: `MOV [EDI+2*EBX], AH`

c. Destination operand in `MOV [EBX+EDI+0x0400], AL`



9. Describe the use of the MOV instruction.

10. 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.

```
MOV AX, 0  
MOV BX, AX  
MOV CX, 0x0A  
MOV DX, 0x100  
MOV SI, 0x200  
MOV DI, 0x300
```

11. Describe the operation of the MOVSB/MOVB instructions. How/when are these instructions useful?
12. Assume: AX = 0x0100, DX = 0x8100, (0x100) = 0x00, (0x101) = 0xFF. What are the results of the following instructions?
- a. MOVSB EBX, AX
  - b. MOVSB EBX, DX
  - c. MOVB EBX, DX
  - d. MOVSB EBX, BYTE PTR [100H]
  - e. MOVSB EBX, WORD PTR [100H]

13. Explain the operation of the XCHG instruction.

14. Explain the operation of the LEA instruction.

15. **Example:** Given the initial memory state below:

	Lo		Hi	
0x528000	50	88	31	A3
0x528004	B2	FF	0F	7D
0x528008	07	D0	BE	22
0x52800C	11	96	00	14

Show the results of the following short instruction sequence.

```
MOV    EAX, 0x528000
MOV    EBX, [EAX+2]
XCHG  BL, BH
LEA   EDX, [EAX+8]
MOV    ECX, [EDX-3]
```