

# 16.317: Microprocessor Systems Design I

Fall 2015

## Lecture 12: Key Questions

October 2, 2015

1. Describe the operation of the compare instruction.

2. Complete the following table that describes the different x86 condition codes.

<b>Mnemonic (cc)</b>	<b>Condition tested</b>	<b>Status flag setting for true condition</b>
O		
NO		
B, NAE, C		
NB, AE, NC		
S		
NS		
P, PE		
NP, PO		
E, Z		
NE, NZ		
BE, NA		
NBE, A		
L, NGE		
NL, GE		
LE, NG		
NLE, G		

3. Describe the operation of the conditional move instruction.
4. Describe the operation of the SETcc instruction. How can this instruction be used?
5. **Example:** Show the results of the following instructions, assuming that  
(100H) = 0001H, (102H) = 0003H, (104H) = 1011H, (106H) = 1011H, (108H) = ABCDH,  
(10AH) = DCBAH

What complex condition does this sequence test?

```
MOV    AX, [100H]
CMP    AX, [102H]
SETLE  BL
MOV    AX, [104H]
CMP    AX, [106H]
SETE   BH
AND    BL, BH
MOV    AX, [108H]
CMP    AX, [10AH]
SETNE  BH
OR     BL, BH
```

6. Describe the two general classes of jump instruction.

7. Given the instructions below, what are the resulting register values if:

- AX = 0010H, BX = 0010H
- AX = 1234H, BX = 4321H

What type of high-level program structure does this sequence demonstrate?

```
        CMP  AX, BX
        JE   L1
        ADD  AX, 1
        JMP  L2
L1:     SUB  AX, 1
L2:     MOV  [100H], AX
```

8. **Example:** Given the instructions below, what are the resulting register values if, initially, AX = 0001H?

What type of high-level program structure does this sequence demonstrate?

```
      MOV  CX, 5
L:    SHL  AX, 1
      DEC  CX
      JNZ  L
```

9. **Example:** Given the instructions below, what are the resulting register values if, initially, AX = 0001H?

What type of high-level program structure does this sequence demonstrate?

```
      MOV  CX, 5
L:    JCXZ  END
      ADD  AX, AX
      DEC  CX
      JMP  L
END:  MOV  [10H], AX
```

10. Describe the x86 loop instructions, as well as how these instructions can be used in a typical program.

11. Rewrite the post-tested loop example from earlier to use a loop instruction.

```
L:    MOV  CX, 5
      SHL  AX, 1
      DEC  CX
      JNZ  L
```

12. Describe the operation of the following program.

What is the final value of SI if the 15 bytes between 0A001 and 0A00F have the following values?

00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E

```
MOV DL, 05
MOV EAX, 000A000h
MOV ESI, 00000000h
MOV CX, 000Fh
AGAIN: INC ESI
      CMP [EAX+ESI], DL
      LOOPNE AGAIN
```