16.317: Microprocessor Systems Design I

Summer 2012

Lecture 4: Key Questions
July 18, 2012

1. Describe the operation of the MUL and IMUL operations.

2. Describe the operation of the DIV and IDIV operations.

3. Explain the general operation of the AND, OR, XOR, and NOT instructions.

4. **Example:** Show the state of AL after each instruction in the following sequence:

    MOV AL, 55H
    AND AL, 1FH
    OR AL, C0H
    XOR AL, 0FH
    NOT AL

5. Explain the operation of shift instructions. What is the difference between SHR and
    SAR?

6. **Example:** Given AL = 15H, CL = 03H, and CF = 0, show the state of AL and CF
    after each instruction in the sequence below:

    SHL AL, 1
    SHR AL, CL
    SAL AL, 5
    SAR AL, 2

7. Explain the operation of the rotate instructions (ROL, ROR, RCL, RCR).

8. **Example:** Given AL = 43H, CL = 04H, and CF = 0, show the state of AL after each instruction in the sequence below:

   ROR AL, 2
   ROL AL, CL
   RCR AL, 3
   RCL AL, 4