

# **16.317: Microprocessor Systems Design I**

Spring 2012

## Lecture 11: Key Questions February 15, 2012

1. Explain how logical operations can be used to clear, set, or flip one or more bits.
2. Explain the operation of shift instructions. What is the difference between SHR and SAR?

3. **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
```

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