

# ECS 235B Module 47

## Information Flow and Integrity

# Integrity Mechanisms

- The above also works with Biba, as it is mathematical dual of Bell-LaPadula
- All constraints are simply duals of confidentiality-based ones presented above

# Example 1

For information flow of assignment statement:

$$y := f(x_1, \dots, x_n)$$

the relation  $\text{glb}\{x_1, \dots, x_n\} \geq y$  must hold

- Why? Because information flows from  $x_1, \dots, x_n$  to  $y$ , and under Biba, information must flow from a higher (or equal) class to a lower one

# Example 2

For information flow of conditional statement:

**if**  $f(x_1, \dots, \underline{x}_n)$  **then**  $S_1$ ; **else**  $S_2$ ; **end**;

then the following must hold:

- $S_1, S_2$  must satisfy integrity constraints
- $\text{glb}\{ \underline{x}_1, \dots, \underline{x}_n \} \geq \text{lub}\{ \underline{y} \mid y \text{ target of assignment in } S_1, S_2 \}$

# Quiz

For the iterative statement:

```
while  $f(x_1, \dots, x_n)$  do  $S$ ;
```

which of the following is *not* a condition for certification?

1. The loop must terminate
2. The block  $S$  must be secure
3.  $\text{lub}\{ \underline{x}_1, \dots, \underline{x}_n \} \geq \text{glb}\{ \underline{y} \mid y \text{ target of assignment in } S \}$