



## Computer Architecture II – WS 05/06

(due: Monday, 05.12.2005)

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### Exercise 1: (Wrapped Exponents)

(5 + 5 points)

Whenever non masked overflows or underflows occur, the exponent of the result is adjusted.

Let:

$$\alpha = 3 \cdot 2^{n-2} \quad a, b \in \mathcal{R} \quad x = a - b$$

To be proven:

1.  $OVF(x) \Rightarrow 2^{e_{min}} < x \cdot 2^{-\alpha} < X_{max}$
2.  $UNF(x) \Rightarrow 2^{e_{min}} < x \cdot 2^{\alpha} < X_{max}$

### Exercise 2: (Logical Right Shifter)

(10 + 10 points)

Let:

$$n = 2^m \quad a, c \in \{0, 1\}^n \quad b \in \{0, 1\}^m \quad x \in [0 : n - 1]$$

For a given  $a$  and a given  $x$  the function  $lrs$  is defined as:

$$lrs(a, x) = (0^x a[n - 1 : x])$$

A  $n$ -bit logical right shifter ( $n$ -LRS) is a circuit with two inputs  $a$ ,  $b$  and an output  $c$  satisfying:

$$c = lrs(a, \langle b \rangle)$$

1. Construct an  $n$ -LRS.
2. Prove the correctness of your construction.