Saarland University
Department 6.2 - Computer Science
Prof. Dr. W. J. Paul
M. Sc. Andrey Shadrin

Computer Architecture II - WS 08/09

Exercise Sheet 3 (due: 17.11.08)

Excercise 1: (Wrapped Exponents (2+2 points)

Let $\alpha = 3 \cdot 2n - 2$. Show that for $x = a/b$, where a and b are representable FP-numbers $\neq \pm\infty$ and $b \neq 0$:

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

Excercise 2: (LOSS) (3+3 points)

Let

$$\hat{\eta}([x]_{p-e}) = (s, \hat{e}, \hat{f})$$
$$\eta([x]_{p-e}) = (s, e, f)$$

Prove:

$$LOSS_b(x) \Leftrightarrow LOSS_b([x]_{p-\hat{e}})$$
$$LOSS_a(x) \Leftrightarrow LOSS_a([x]_{p-\hat{e}})$$

Excercise 3: (TINY & LOSS) (3+3 points)

In the lecture we argued that the following two implications hold:

$$LOSS_a(x) \Rightarrow LOSS_b(x)$$
$$TINY_a(x) \Rightarrow TINY_b(x)$$

To be proven or disproven:

$$LOSS_a(x) \Leftarrow LOSS_b(x)$$
$$TINY_a(x) \Leftarrow TINY_b(x)$$

Excercise 4: (Leading Zeros Counter) (5+5 points)
For a string x, we denote by $lz(x)$ the number of leading zeros of x. Let $n = 2m$. An n-leading zero counter is a circuit with inputs $x[n-1:0]$ and outputs $y[m:0]$ satisfying $< y >= lz(x)$.

1. Construct an n-leading zero counter.
2. Prove the correctness of your construction.