University of the Saarland
Department 6.2 – Informatik
Prof. Dr. W.J. Paul

Computer Architecture II – WS 05/06

(due: Monday, 06.02.2006)

Exercise 1: (Speed of light) **(5 points)**

Let:

$$cs = 4\ GHz \qquad ls = 300.000\ \frac{km}{s}$$

Calculate the maximal distance a signal (having a speed of $\leq$ ls) can propagate within one cycle assumed a clock speed of cs.

In the following exercises you will prove that if you replicate each message bit 10 times instead of 8 times, and you allow one bit to flip each 10 bits, then the message will still be sampled correctly.

The numbering of the lemmata is chosen according to the numbering in the script, which is linked on the lecture homepage.

Let:

$$M = \mathbb{N}^9 \qquad N = \mathbb{N}^8 \qquad N \subset M$$
$$F : \mathbb{N}^9 \to \mathbb{N}^8$$
$$F(M) = N$$

Exercise 2: (Lemma 4.1') **(10 points)**

Let:

$$k \in F([0:8])$$
$$\beta = \begin{cases} 0 & \text{if } e_r(cy(i)) \geq e_s(i) + t \text{ p-max } + t_s \\ 1 & \text{otherwise} \end{cases}$$

To be proven:

$$R^{cy(i)+\beta+k} = S^i$$

Exercise 3: (Lemma 6.1') **(15 points)**

To be proven:

$$sy(0) \in cy(0) + [2:5]$$

University of the Saarland
Department 6.2 – Informatik
Prof. Dr. W.J. Paul

Computer Architecture II – WS 05/06

(due: Monday, 06.02.2006)

Exercise 4: (Lemma 6.2') **(15 points)**

To be proven:

$$v^{cy(10i)+k''} = f(m)_i : k'' \in [5:10]$$

Exercise 5: (Lemma 6.3') **(20 points)**

- $sync^j = 1$, $j \in cy(8i) + [3:4]$.
- $str^t = 1$, $t = j + 8y + 4$ ($str^t = 1$).
- The interval $[j:t]$ is not to long, i.e. $t < j + 300$.
- There is no sync in the interval $(j:t)$, i.e. $sync^l = 0 : l \in (j:t)$

Claim:

$$v^t = f(m)_{i+y}$$