University of the Saarland
Department 6.2 – Informatik
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Computer Architecture II – WS 05/06

(due: Monday, 09.01.2006)

Exercise 1: (Majority Votes) **(5 + 5 + 10 + 10 points)**

Let:

$$n \in \mathbb{N}, \qquad a \in \{0,1\}^{2 \cdot n+1}, \qquad b \in \{0,1\}$$

For a given a the function $major$ is defined as:

$$major(a) = \begin{cases} 1 & : (\sum_{i=0}^{2 \cdot n} a[i]) \geq (n+1) \\ 0 & : otherwise \end{cases}$$

A 'majority voter' is a circuit with input a and output b satisfying:

$$b = major(a)$$

1. Construct a majority voter having a delay of $\Theta(n)$
2. Prove the correctness of construction (1.).
3. Construct a majority voter having a delay of $o(n)$
4. Prove the correctness of your construction (3.).

Figure 1: Merry christmas and a happy new year ;-)