Introduction to Digital Computers / Computer Structure - Spring 2003
Assignment No. 9

Firm Deadline: May 15th - before the beginning of the lecture

1. Answer question 9.1 in chapter 9 of the lecture notes.
2. Answer question 9.2 in chapter 9 of the lecture notes. (See Figure 1 for the difference in signals $A_i(t)$).
3. Answer question 9.3 in chapter 9 of the lecture notes.
4. Answer one of the following questions:
   (a) question 9.4 in chapter 9 of the lecture notes.
   (b) question 9.5 in chapter 9 of the lecture notes.
5. Consider a gate G that consists of two cascaded inverters. Suppose that $t_{pd(G)} > t_{cont}(G) > 0$ and that $t_{su}(FF), t_h(FF) > 0$.
   (a) Show how G together with a FF can be used to build a new Flip-Flop, called FF', for which $t_h(FF') < 0$. Write all the characteristics of FF' in terms of those of FF and G (i.e. setup time, contamination delay, and propagation delay).
   (b) Show how G together with a FF can be used to build a new Flip-Flop, called FF'', for which $t_{su}(FF'') < 0$. Write all the characteristics of FF' in terms of those of FF and G (i.e. hold time, contamination delay, and propagation delay).

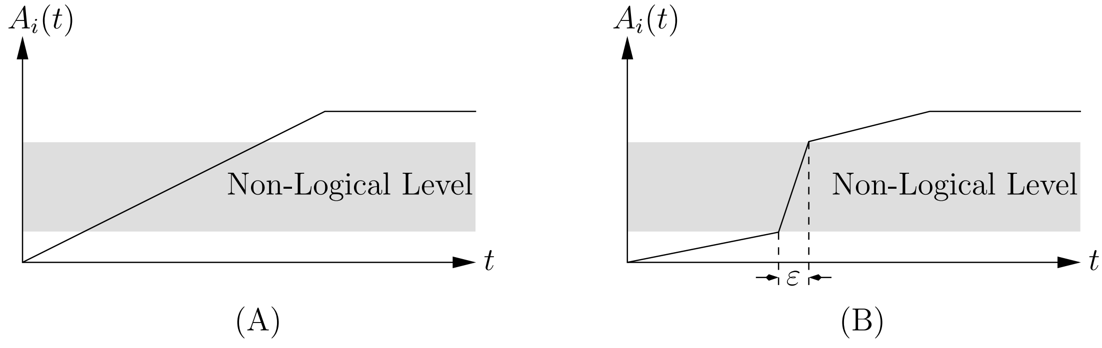

Figure 1: (A) Non-decreasing signals $A_i(t)$ in proof of Claim 9.1 in chapter 9 of the lecture notes. (B) Non-decreasing signals $A_i(t)$ in Questions 9.2 in chapter 9 of the lecture notes.