

## Homework Assignment No. 14

Due Monday April 19, 2004 in class

Note: If you take the time to perform the on-line course evaluation, you may submit a sheet attesting to that fact with your name and will be given full credit for this assignment. In other words, you can do the on-line course evaluation or the homework assignment (or both – you will receive the highest score in this case). Answers will be posted on the web-site as usual.

### Problem 1 - (10 points)

Problem 8.4-1 of Allen and Holberg, 2<sup>nd</sup> edition

### Problem 2 – (10 points)

Problem 8.6-3 of Allen and Holberg, 2nd edition

### Problem 3 – (10 points)

Problem 8.6-4 of Allen and Holberg, 2nd edition.

### Problem 4 - (10 points)

A comparator consists of an amplifier cascaded with a latch as shown below. The amplifier has voltage gain of  $10\text{V/V}$  and  $f_{-3\text{dB}} = 100\text{MHz}$  and the latch has a time constant of  $10\text{ns}$ . The maximum and minimum voltage swings of the amplifier and latch are  $V_{OH}$  and  $V_{OL}$ . When should the latch be enabled after the application of a step input to the amplifier of  $0.05(V_{OH}-V_{OL})$  to get minimum overall propagation time delay? What is the value of the minimum propagation time delay? It may be useful to recall that the propagation time delay of the latch is given as  $t_p = \tau_L \ln\left(\frac{V_{OH}-V_{OL}}{2v_{il}}\right)$  where  $v_{il}$  is the latch input ( $\Delta V_i$  of the text).

