Department of Electrical and Computer Engineering, George Mason University
ECE331 — Digital System Design — Spring 2007

Homework 9: Due Tuesday April 10th (10:30 am, beginning of class)

Write your name at the top of each page.

- Start a **new page for each problem**.
- **Order** and **staple** your pages.
- Always complete the reading assignments *before* attempting the homework problems.
- Show all of your work. Use written English, where applicable, to provide a log of your steps in solving a problem. (For numerical homework problems, the writing can be brief.)
- A solution which requires physical units is *incorrect* unless the units are listed in the result.
- Underline, circle or box your result.
- Always write neatly. Communication skills are essential in engineering and science. If neither the TA nor the instructor can read it, you will receive zero points.

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1) Terminal Characteristics and Interfacing

a) Determine the fanout limit when a Texas Instruments SN7400 (Quad 2-Input NAND) drives an ON Semiconductor SN74LS00 (Quad 2-Input NAND). For the SN74LS00, assume V_{IN}=2.7 V when determining I_{IH}, if needed. The data sheet for the Texas Instruments part can be found on the class website.

b) Determine the fanout limit when an ON Semiconductor SN74LS00 (Quad 2-Input NAND) drives a Texas Instruments SN7400 (Quad 2-Input NAND). For the SN74LS00, assume V_{IN}=2.7 V when determining I_{IH}, if needed.

2) Power Dissipation

For each IC listed below, determine the quiescent power dissipation, dynamic power dissipation and total power dissipation when one gate from each IC drives a capacitive load of CL = 15 pF at switching frequencies of 100 kHz, 1 MHz and 10 MHz at VCC = 5 V. Assume the gate output is HIGH 3/4 of the time and LOW 1/4 of the time. All the necessary data sheets can be found on the class website.

a) ON Semiconductor 74LS283

b) Philips 74F283

c) Philips 74HC283