EE6013 VLSI Design—Homework 1

1. **Transistor Sizing** (4 points)
   Figure 1 depicts an inverter. If your boss want you to design the inverter to drive a load C, then how do you design the inverter such that its speed is high and its area is small? Design the inverter and use Spice to simulate the inverter for C=1pf and 5pf.
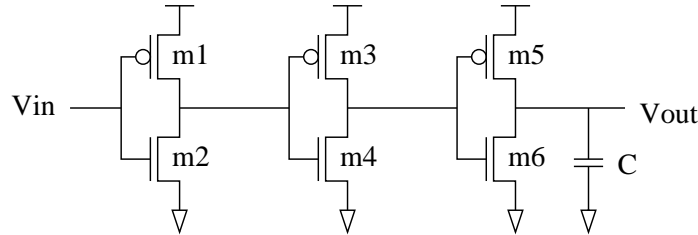

Figure 1: An inverter.

2. **MOS Theory** (3 points)
   Show that the bottom MOS (M1), Fig. 2, in a series connection of two MOS transistors cannot operate in the staturation region. Neglect the body effect.
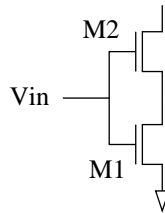

Figure 2: MOS transistors operating in series.

3. **MOS Theory** (3 points)
   Show that the series connection of MOS transistors shown in Fig. 3 behaves as a single MOS transistor with twice the length of the individual MOS transistors. Neglect the body effect.
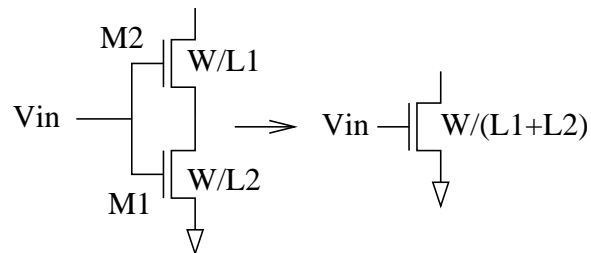

Figure 3: MOS transistors operating in series.